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thesis entitled

RHEOLOGICAL BEHAVIOR
OF
CALCIUM CARBONATE-CORN SYRUP MIXTURES

presented by

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has been accepted towards fulfillment
of the requirements for

M.S. degree in Agricultural Engineering

James F. Steffe
Major professor

Date July 22, 1994

RHEOLOGICAL BEHAVIOR

OF

CALCIUM CARBONATE-CORN SYRUP MIXTURES

by

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A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE

in
Agricultural Engineering

Department of Agricultural Engineering

1994

ABSTRACT

RHEOLOGICAL BEHAVIOR OF CALCIUM CARBONATE-CORN SYRUP MIXTURES

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The rheological behavior of calcium carbonate-corn syrup mixtures was studied using mixing viscometry techniques. Materials are found to exhibit power law behavior. Changes in the flow index behavior and consistency coefficient were evaluated as functions of temperature and concentration. Decreases in the consistency coefficient (K) with temperature increases, at a constant concentration, were explained by an Arrhenius model. Temperature had little effect on the flow behavior index. Several exponential models were used to demonstrate the influence of temperature and concentration, both separately and combined, on shear stress-shear rate relationships.

ACKNOWLEDGEMENTS

Sincere thanks to *Dr. James Steffe*, my advisor and major professor for his guidance, comments, suggestions, support, encouragement, enthusiasm, friendship, patience and for helping me *to go with the flow* in the different stages of this study.

Thanks to the Chilean government for their financial support that made this work possible.

Thanks to my mother Adriana who gave me the reason to further my education.

Thanks to my aunt Ita and brother Mario for their support.

Thanks to Gloria Bateman, Valerie Geyer and to all the secretaries of the Department of Agricultural Engineering and all the persons that helped me more than once to complete my studies and related activities.

Thanks to my friends: Neba Ambe, Habib Chowdhury, Danny Campos, Chris Daubert, Andy Fogiel, Armando Fuji, Mario Fusco, Phil Gerrish, Kevin Kalmbach, George Mungai, Carlos Semidei, James Schaper, Rick Stowell, Wee Tan, Muluken Tilahun and, Andy Wedel. Thanks for making my stay more pleasant here at Michigan State University.

Special Thanks to Romelia & Irvin Widders, and to the families Crouch, Mungai, Hudy, and Roberts for they help and friendship.

Thanks to Lorena for her support, encouragement and tolerance.

And overall, thanks to GOD, who made this accident a reality.

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NOMENCLATURE

b = *impeller blade height, m*

C = *concentration, weight percent* $CaCO_3$ *in corn syrup*

d = *impeller diameter, m*

E_a = *flow activation energy, cal/g mole*

K = *consistency coefficient, Pa* s^n

K_C = *constant depending on concentration*

$K_{(T, C)}$ = *constant depending on T and C*

K_0 = *frequency factor, Pa s*

K_T = *constant depending on temperature*

k' = *constant for a particular impeller, 1/rad*

M = *torque, N m*

n = *flow behavior index, dimensionless*

$\bar{n}$ = *average flow behavior index, dimensionless*

p = *power, N m/s*

P_o = *power number, dimensionless*

R = *gas constant, cal/K g-mole*

R^2 = *determination coefficient, dimensionless*

T = *absolute temperature, K*

α = *constant depending on temperature and concentration, dimensionless*

α_0 = *factor determined by the shape and dimensions, dimensionless*

$\dot{\gamma}$ = *shear rate,* s^{-1}

$\dot{\gamma}_a$ = *average shear rate,* s^{-1}

μ = *viscosity of Newtonian fluids, Pa s*

$\mu_{avg\ app}$ = *average apparent viscosity, Pa s*

μ_{app} = *apparent viscosity, Pa s*

μ_r = *relative viscosity, ratio of the viscosity of suspension*

to viscosity of suspending liquid, dimensionless

ρ = *fluid density,* kg/m^3

σ = *shear stress, Pa*

σ_0 = *yield stress, Pa*

σ_a = *average shear stress, Pa*

Φ_r = *volume concentration, dimensionless*

Ω = *rotational speed of the impeller, rad/s*

CHAPTER I

INTRODUCTION

Calibration is a basic procedure required to ensure that an analytical method can give accurate results. This process is based on the use of some pre-defined standards which can be oils, solutions, pure substances and basically any system with a well known property that remains constant under certain conditions. It is impossible to calibrate an instrument to an accuracy greater than that of the standard with which it is compared. A rule often followed is that the calibration standard should be about ten times as accurate as the instrument being calibrated (Doebelin, 1983).

In flow measurements for example, a flow-rate calibration depends on standards of volume (length) and time, or mass and time. A primary calibration is based on the establishment of steady flow through the flowmeter to be calibrated and subsequent measurement of the volume or mass of flowing fluid that passes through in an accurately timed interval. Any stable and precise flowmeter calibrated by such primary method, then itself becomes a secondary flow-rate standard against which other (less accurate) flowmeters may be calibrated conveniently (Doebelin, 1983).

A significant deviation in any calibration from the conditions in which the calibration was performed will invalidate the measurements that can be obtained with such a calibrated instrument. Possible sources of error for example in flowmeters include variations in fluid properties such as density, viscosity and temperature.

Green (1949) mentioned that commercial rotational viscometers are calibrated using liquids of known viscosity. These liquids of known properties (Green, 1949) should be Newtonian and not to have a very high viscosity, at the same time the shear rate of the calibrating liquids should be within the shear rate range where the fluid still behaves as a Newtonian substance. These fluids can be oils and, if they present constant properties, can become standard materials.

Calibration can be done using established standard oils, however, some polymers, petroleum oils, butene polymers and silicone oils have been used as well. Another potential group of standards is represented by pure compounds and solutions. Also, Rao and Vitali (1974) have noted that calibration of a coaxial cylinder viscometer can be done using constant suspending weights.

Pure substances that can be used as standards were mentioned by Hull and Steffe (1992). Some of these fluids are difficult to purify. Others have inherent difficulties. Glycerin, for example, can become hygroscopic at room temperature. There are some certified fluids that are formed by making solutions of different pure fluids.

When dealing with a sucrose-water solution at high concentration, a 1% change in sucrose can produce up to 25% in change in the viscosity. This fact means that this solution is inconvenient due to potential error. Corn syrups exhibit a constant viscosity both in steady and dynamic shear conditions that makes them useful as Newtonian calibration fluids when some of the reference standard oils are not suitable (Hull and Steffe, 1992). Corn syrup can present a tendency to dry due to mass transfer with exposure to air. Aging may also create changes. If corn syrups do not suffer these problems they can become useful for different food engineering problems where calibration and process standardization are needed.

Some oils and polymers are commonly used to perform day-to-day calibration of rheometers. These standards are based on a well known constant viscosity at a certain temperature and pressure, and these fluids emulate water which is the primary material used as a reference in viscosity calculations (Hull and Steffe, 1992).

The suspending weight method to calibrate coaxial viscometers is based on suspending some constant weights from the axis of the sensor and, when the drive is in constant low speed movement, recording the torque readings with increasing weights. Based on these measurements it is possible to compute with confidence the maximum axial torque. This can then be used to compute some rheological properties that depend directly on the axial torque (Castro et al., 1990).

A suitable shear-thinning standard fluid, for the food industry does not exist. To address this need, the following objectives were formulated for the current work:

1) Study the shear-thinning behavior of suspensions formed from mixtures of calcium carbonate and corn syrup.
2) Evaluate the influence of temperature and concentration on the behavior of calcium carbonate-corn syrup mixtures.

CHAPTER II

REVIEW OF LITERATURE

2.1. Rheology Definition and Applications.

Definition of Rheology.

The term "rheology" was invented by Eugene C. Bingham in 1929 and has since been defined as "the study of the deformation and flow of matter" (Friedrickson, 1964; Tanner, 1985), or as "the study of the manner in which materials respond to applied stress and strain" (Steffe, 1992). All materials have rheological properties and the area is relevant in many fields of study, such as geology and mining (Cristescu, 1989), concrete technology (Tattersal and Banfill, 1983), soil mechanics (Vyalov, 1986; Haghighi et al., 1987), plastics processing (Dealy and Wissburn, 1990), and tribology (study of lubrication, friction and wear).

Applications of Rheology.

Rheology is useful in the food area for different purposes such as to improve product development, processing methodology and final product quality. Specifically, there are numerous reasons why rheological data are needed in the food industry (Escher, 1983; Steffe, 1992):

a. Process engineering calculations for a wide range of equipment such as pipelines, pumps, extruders, mixers, coaters, heat exchangers, homogenizers, calenders, and on-line viscometers.

b. Determination of ingredient functionality in product development.

c. Regulation of on-process and final product quality control.

d. Shelf life correlation.

e. Evaluation of food texture by correlation to sensory data.

f. Analysis of rheological constitutive equations.

Many factors influence rheological properties. Examples include temperature and soluble solids as well as the chemical and biochemical reactions which occur in food products. A knowledge of fluid properties allows one to make economic improvements in a wide variety of processes (Osorio, 1985).

2.1.1. Fluids, Newtonian and non-Newtonian Fluids.

Fluids are groups of molecules that exhibit the property of deformation without any change of volume under the action of a force (Sherman, 1990). Fluids are Newtonian if they follow Newton's law (Equation 1), otherwise they are non-Newtonian and the viscosity coefficient is called apparent viscosity. There are numerous models which represent the behavior of the different fluid systems, however some of the most important models are the Bingham model (Equation 2) and the Herschel-Bulkley model (Equation 3):

$$\sigma = \mu \, \dot{\gamma} \qquad (1)$$

$$\sigma = \sigma_0 + K\,\dot{\gamma} \qquad (2)$$

$$\sigma = \sigma_0 + K\,\dot{\gamma}^n \qquad (3)$$

Newtonian fluids possess low concentrations of solids while non-Newtonian fluids generally have a high concentration of solids and may also contain lipids, proteins, carbohydrates and fibers which interact with the flow and produce deviations from Newtonian behavior (Osorio, 1985). Non-Newtonian fluids are characteristically food slurries, pharmaceutical products, gums, biological fluids and oils. (Skelland, 1967). Emulsion and dispersions, especially those encountered in the food industry, are complex systems that exhibit a wide variety range of rheological behavior (Peleg and Bagley, 1983).

2.1.2. Time-Dependency.

Fluids whose behavior depends on the time of application of a stress are called time-dependent fluids, otherwise they are time-independent. Time-dependent fluids are thixotropic if apparent viscosity decreases with time or rheopectic if apparent viscosity increases with time (Tanner, 1985; Doublier and Lefevre, 1989).

2.2. Types of Measurements and Common Instruments.

Fundamental properties are independent of the instrument on which they are measured, so different instruments will yield the same results. This is an ideal concept and different instruments rarely yield identical results. Some examples of instruments which give subjective results include the following (Bourne, 1982); Farinograph, Mixograph, Extensograph, Viscoamylograph and the Bostwick Consistometer.

Common Rheological Instruments.

Common instruments capable of measuring fundamental rheological properties, may be placed into two categories (Steffe, 1992):

- rotational type (parallel plate, concentric cylinder, cone and plate, mixer),
- and tube type (glass capillary, pipe).

Rotational viscometers may be operated in the steady shear (constant angular velocity) or dynamic (oscillatory) mode.

2.3 Mixer Viscometry.

The general principle of measurement used in mixer viscometry is based on the determination of the torque on the shaft of the impeller as a function of its rotational speed (Castell-Perez and Steffe, 1992). This application is based on the power consumption in a vessel for a Newtonian fluid and can be expressed in terms of a power number, $P_o = (p/d^5\Omega^3\rho)$ in the laminar flow region, such as:

$$P_0 = \frac{A}{R_e} \tag{4}$$

or

$$\frac{p}{d^5\Omega^3\rho} = \frac{A\ \mu}{(d^2\Omega\ \rho)} \tag{5}$$

where:

P_0 = power number, dimensionless

R_e = mixing Reynolds number, dimensionless

p = power, N m/s

d = impeller diameter, m

Ω = rotational speed of the impeller, rad/s

ρ = density, kg/m^3

μ = Newtonian viscosity, Pa s

A = constant depending on system geometry, dimensionless

Equation (5) can be used for power law fluids if μ is replaced by an apparent viscosity, μ_{app}, evaluated at an average rate of shear, $\dot{\gamma}_a$, which is defined as

$$\dot{\gamma}_a = k'\ \Omega \tag{6}$$

where

$\dot{\gamma}_a$ = shear rate, s^{-1}

k' = constant for a particular impeller (Steffe, 1992), 1/rad

2.3.1. Previous Research in Mixer Viscometry.

Castell-Perez and Steffe (1990) evaluated established mixer viscometry methods, such as the viscosity matching method and the slope method for average shear rate calculations by agitation of time-independent, non-Newtonian fluids. Their final results showed that the mixer constant, k', is not a constant for all ranges of fluid rheological properties, system geometries (cup and impeller) and impeller rotational speeds. Castell-Perez et al. (1991) were studying a simple and accurate procedure to determine the flow properties of power-law fluids using a paddle type mixer viscometer. They considered the mixer as analogous to a concentric cylinder system and incorporated the end effect in modeling. Data collection is reduced according to these authors because calibration with standard fluids is not necessary to estimate average shear stress and shear rate values.

2.4. Properties of Suspensions, Dispersions and Multiphase Systems.

Suspensions of Particles in Newtonian Fluids.

a) Generalities.

Particles suspended in Newtonian fluids cause additional viscous dissipation during flow and higher viscosities compared to the suspending fluid itself. Also, suspensions of particles in Newtonian fluids usually exhibit one or more of the following properties:

i) an unbounded viscosity at low shear rates (shear stress),

ii) time and/ or strain dependent properties and shear-thinning (pseudoplasticity),

iii) shear-thickening (dilatancy), and

iv) normal stresses.

These effects are the reflections of the structures generated by particle interactions causing redistribution of particles and their orientations and the net effects of these redistribution processes on the bulk rheological behavior of the system.

Dilute suspensions of small particles in Newtonian fluids usually behave as a Newtonian fluid. However, at moderate and high concentrations, the viscosity of the suspension becomes a function of the strain rate applied. Non-Newtonian behavior exhibited by suspensions of particles in Newtonian fluids can be a result of several factors influencing the suspension (Kamal and Mutel, 1985).

Non-hydrodynamic Forces:

The most important forces are brownian forces, electrical forces which arise from the charges on particles, London-van der Waals forces. Non-hydrodynamic forces are dominant in concentrated suspensions of colloidal particles (particles smaller than 1 μm) and the rheological behavior of the suspension is determined by the competition between non-hydrodynamic and hydrodynamic forces. Thus viscosity is a function of the bulk rheological properties of colloidal dispersions in the microstructure. The relevant theories have been reviewed by Mewis (1980). The importance of non-hydrodynamic forces diminishes with increasing size. Generally, for suspensions of particles greater than 10 μm the rheological behavior is mainly determined by the hydrodynamic forces.

<u>Particle Interactions</u>:

i) Hydrodynamic interactions of particles, cause a change in the velocity distribution in the vicinity of other particles.

ii) Direct particle-particle interactions are a significant energy sink and may allow the formation of aggregates and produce the inhibition or promotion of structures by the flow and change in particle orientation distribution with the flow strength as well as anisotropic distribution of particles in some flows.

The relative importance of these factors on the bulk rheological properties of a suspension, and hence the value of the particle concentration up to which the suspension behaves as a Newtonian fluid, depends on the nature, shape and dimensions of the solid particles and to a certain extent on the properties of the suspending fluid (Kamal and Mutel, 1985).

b) **Concentration - Relative Viscosity Relations**.

<u>Dilute Suspensions.</u>

Hydrodynamic theories for the concentration dependence on relative viscosity of dilute suspensions of particles in a Newtonian matrix have been developed by Einstein (1906 and 1911) (A. Einstein, Ann. Physik., **19**, 289, 1906; A. Einstein, Ann. Physik., **34**, 591, 1911) for spherical particles, by Jeffrey (G. B. Jeffrey. Proc. Roy. Soc. (London), **A102**, 161, 1923) for ellipsoids, and by Burgers for cylindrical rods. These theories can be summarized by the following relationship:

$$\mu_r = 1 + \alpha_0 \phi \qquad (7)$$

where:

μ_r = relative viscosity, defined as the ratio of the viscosity of the suspension to the viscosity of suspending fluid, at volume concentration,

ϕ, and α_0 = dimensionless factors determined by the shape, dimensions and orientation of the suspended particles.

Non-dilute Suspensions.

As the concentration is increased above that of the hydrodynamically dilute concentration range, the concentration-relative viscosity relation becomes non-linear, due to particle interactions and non-hydrodynamic forces. Non-linearity has been incorporated into dilute suspension theories in several ways. Some of them have a theoretical basis, while some are totally empirical (Kamal and Mutel, 1985).

Maximum packing fraction.

This concept can explain the influence of particle concentration on the viscosity of the concentrated suspensions using the so-called maximum packing density. There must come a time, as particles are being added when suspensions "jam up", producing a continuous three-dimensional contact throughout the suspension, thus making flow impossible, i.e., the viscosity tends to infinity. The particle phase volume at which this happens is the maximum packing fraction, and its value will depend on the arrangement of the particles (Barnes et al., 1989).

Multiphase Systems.

Suspensions, emulsions and pastes are the single most important area of rheological research. These three types of multiphase systems have much in common, although in suspensions the dispersed phase is solid, in emulsions it is another liquid and in pastes the particles are in physical contact. All these systems may have one of the following conditions:

a) dilute with no particle interaction (with the exception of pastes),

b) stable, as in sterically stabilized paints,

c) flocculated with structure fully foamed,

d) partially stable with some structure forming and

e) sedimenting.

CHAPTER III

MATERIALS AND METHODS.

3.1 Materials.

3.1.1. Sample Preparation.

Corn syrup and calcium carbonate were used as raw materials to prepare different mixtures from which rheological characterization was performed. Calcium carbonate, obtained from Mallinckrodt Co., had a mean particle size of 7-9 μm. Corn syrup was obtained from A.E. Staley. It was a high fructose corn syrup (Isosweet 5500) with a nominal viscosity equal to 0.8 Pa s at 25°C.

3.1.2. Viscometer Calibration.

A coaxial cylinder viscometer (Haake RV-12) using a M 150 torque sensor, a MV cup, and a MV paddle impeller with a NESLAB RTE-9 refrigerated circulating bath was used to determine rheological properties of the mixtures over a wide range of concentrations and temperatures. The viscometer was equipped with a built-in water circulator to maintain samples at a constant temperature.

In this study the torque sensor was not calibrated using standard oil. The suspending weight calibrating system (Castro et al., 1990) was used to determine the maximum axial torque that the drive produced. The deviation of maximum torque from the value reported by the manufacturer was 2.8 % which is permissible in engineering calculations. Based on this value, all calculations of shear stress and shear rate were performed.

3.2 Methods.

3.2.1. Equipment Preparation.

For the preliminary data collection, a traditional concentric cylinder system (MVI sensor and cup) was used. There was no thixotropy in any sample but the existence of settling was found. This settling effect made the resulting data unacceptable; hence new measuring system was needed and the best option for this purpose was mixer viscometry. At this point in the study, an MV paddle impeller (Figure 1) and cup were selected to perform the measurements, thus avoiding any influence of settling on measurements to be performed. All subsequent measurements were made using this system.

3.2.2. Data Collection.

Eight data points were taken at each of the following impeller speeds (rpm): 1, 2, 4, 8, 16, 32, 64, 128, 256, 128, 64, 32, 16, 8, 4, 2, 1. From these, the average reading was obtained. Using the maximum axial torque attained by the weight suspension calibration, the torque value was obtained, and from the rpm at which the readings were taken, the angular velocity for each measurement was calculated.

3.2.3. Analytical Models Used in this Study.

In this study three models were considered: Newtonian, Power-law, and Herschel-Bulkley. The power law model best represented the rheological behavior of calcium carbonate-corn syrup mixtures.

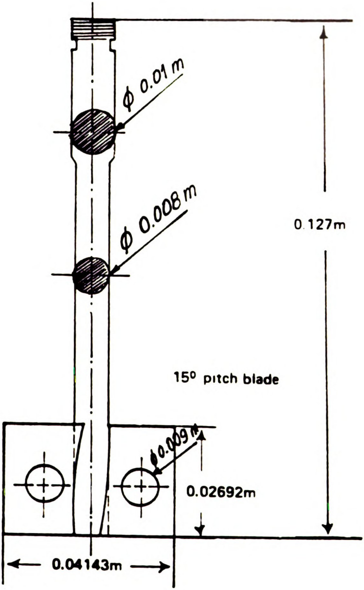

Figure 1. Haake MV paddle sensor.

3.2.4. Shear Stress and Shear Rate Calculations.

With the values of the angular velocity and the impeller constant k', taken from the literature as k' = 4.47 1/rad; (Steffe, 1992), using the Equation (6) the average shear rate values were obtained.

The average shear stress values were calculated as:

$$\sigma_a = \frac{2\,M}{\pi\, d^3 \left[\dfrac{b}{d} + \dfrac{1}{3}\right]} \tag{8}$$

where :

k' = impeller proportionality constant, 1/rad

M = torque, N m

d = impeller blade diameter, m

b = impeller blade height, m

The corresponding n and K values were obtained from the linear regression analysis between the shear stress-shear rate values, for each condition studied.

3.2.5. Concentrations and Temperature.

This study was performed using 5 different concentrations (0, 5, 15, 25 and 35 weight percent) of calcium carbonate. Three different temperatures (25, 40 and 55°C) were used to get measurements of torque at ten different speeds of rotation. Three replications were done for each data set. Angular velocity and the corresponding torque value at each condition was computed and from these numbers the respective flow behavior index and consistency coefficient values were calculated by a regression analysis between the natural log of the angular velocity and torque. Each data set was obtained for each one of the different conditions of temperature and concentration.

The different exponential models were fitted for shear-stress and shear-rate, and all the values were combined in a non-linear fitting procedure to get a model which could collectively explain the behavior of shear stress in terms of shear rate, concentration and temperature.

3.2.6. Temperature Effect at Each Concentration.

The literature mentions that an Arrhenius-type equation is commonly used to quantify the effect of the temperature on the rheological behavior of fluids (Ibarz, 1993). So, for power-law fluids, the consistency coefficient can be expressed as:

$$K = K_0 \exp\left[\frac{Ea}{RT}\right] \qquad (9)$$

where:

K_0 = frequency factor, Pa s

Ea = flow activation energy, cal/g-mole

R = universal gas constant, cal/K g-mole

T = absolute temperature, K

The general analytical model that explains the temperature effect at each concentration has the general expression:

$$\sigma_a = f(T, \dot{\gamma}_a) = K_T \exp\left[\frac{Ea}{R\,T}\right] \dot{\gamma}_a^{\bar{n}} \qquad (10)$$

where:

$\bar{n}$ = average of n values for all temperatures and concentrations.

$K_T \exp\left[\frac{Ea}{R\,T}\right]$ comes from a regression analysis of all the K values at each concentration.

3.2.7. Concentration Effect at Each Temperature.

The proposed model which takes into account the effect of concentration has the following form:

$$\sigma_a = f(C, \dot{\gamma}_a) = K_C \exp(BC)\, \dot{\gamma}_a^{\bar{n}} \qquad (11)$$

where:

C = % $CaCO_3$ concentration by weight.

$\bar{n}$ = average of n values for all temperatures and concentrations.

and K_C exp (BC) comes from a regression analysis from all the K values at each temperature.

3.2.8. Combined Effect of Temperature and Concentration.

The general expression for the variation of shear stress as a function of temperature, concentration and shear rate has the form:

$$\sigma_a = f\,(T,\, C,\, \dot{\gamma}_a) = K_{(T,\,C)} \exp\left[\frac{Ea}{RT} + BC\right] \dot{\gamma}_a^{\alpha} \qquad (12)$$

where the term

$$K_{(\,T,\,C)} \exp\left[\frac{Ea}{RT} + BC\right] \qquad (13)$$

is obtained from all the K values, and α either comes from the average of all the n values or may be determined separately as a function of temperature and concentration.

CHAPTER IV

RESULTS AND DISCUSSION

Results of modeling all flow curves using the power law equation are presented in Tables 1, 2 and 3. The average value of n ($\bar{n}$ = 0.9101) at all temperatures and concentrations was used in determining the independent effects of temperature and concentration.

4.1. Temperature Effect at Each Concentration.

According to the regression analysis from the different values of K at different temperatures and concentrations (Tables 1 to 3) the following prediction equations for K_T have been obtained at different calcium-carbonate concentrations:

0%: $\ln K_T = -19.53 + 5751.7\ (1/T)$ $R^2 = 0.7935$, number of observations = 9

5%: $\ln K_T = -14.74 + 4317.4\ (1/T)$ $R^2 = 0.5287$, number of observations =10

15%: $\ln K_T = -25.75 + 7894.30\ (1/T)$ $R^2 = 0.9084$, number of observations = 9

25%: $\ln K_T = -25.32 + 7981.6\ (1/T)$ $R^2 = 0.9151$, number of observations =18

35%: $\ln K_T = -16.19 + 5544.3\ (1/T)$ $R^2 = 0.9706$, number of observations = 9

The predictions for the values of K_T are as follows:

0%: $K_T = 3.0E\text{-}09 \exp(5751.7/T)$

5%: $K_T = 4.0E\text{-}07 \exp(4317.4/T)$

15%: $K_T = 7.0E\text{-}12 \exp(7894.3/T)$

25%: $K_T = 1.0E\text{-}11 \exp(7981.6/T)$

35%: $K_T = 9.0E\text{-}08 \exp(5544.3/T)$, and $\bar{n} = 0.9101$

Table 1. Values of flow behavior index, consistency coefficient and R^2 at 25°C.

	Flow Index Behavior	Consistency Coefficient	R^2
Concentration (weight %)	dimensionless	Pa s^n	
0	0.9560	0.9224	0.9990
	1.0032	0.7852	0.9999
	1.0568	0.6547	0.9986
5	0.9581	1.1114	0.9993
	0.9662	1.1015	0.9992
	1.1338	0.6461	0.9899
15	0.8045	2.3145	0.9491
	0.7653	2.3482	0.9479
	0.8237	2.0665	0.9523
25	0.9067	4.2554	0.9994
	0.9085	4.2800	0.9993
	0.8673	4.1873	0.9982
	0.8848	4.3843	0.9990
	0.9520	3.7893	0.9999
35	0.8479	9.3804	0.9997
	0.8152	11.2379	0.9994
	0.6993	7.5629	0.9623

Table 2. Values of flow behavior index, consistency coefficient and R^2 at 40°C.

	Flow Index Behavior	Consistency Coefficient	R^2
Concentration (weight %)	dimensionless	Pa s^n	
0	0.9394	0.3071	0.9902
	1.164	0.1311	0.9917
	0.9737	0.2798	0.9965
5	1.0205	0.2745	0.9999
	0.9911	0.4502	0.9574
	1.1581	0.1453	0.9976
15	1.0136	0.4123	0.9988
	1.0567	0.3532	0.9977
	0.8416	0.8491	0.9883
25	0.8516	1.0246	0.9558
	0.9147	0.7961	0.9552
	0.8166	1.2540	0.9610
	0.8516	1.0246	0.9558
35	0.5421	5.9571	0.8119
	0.5670	4.6503	0.8121
	0.5616	4.9264	0.8140

Table 3. Values of flow behavior index, consistency coefficient and R^2 at 55°C.

	Flow Index Behavior	Consistency Coefficient	R^2
Concentration (weight %)	dimensionless	Pa s^n	
0	0.9672	0.1295	0.9761
	0.8910	0.1896	0.9581
	0.9092	0.1653	0.9706
5	1.0083	0.1244	0.9857
	0.9296	0.2039	0.9768
	0.8681	0.2230	0.9499
	0.6665	0.5706	0.8924
15	0.9798	0.2065	0.9914
	0.8935	0.2954	0.9766
	1.1106	0.1322	0.9957
25	1.1952	0.1448	0.9697
	1.0069	0.3193	0.9986
	1.0345	0.2951	0.9997
	0.9624	0.4165	0.9989
	0.8711	0.5625	0.9893
	0.8745	0.5557	0.9902
	0.9092	0.4692	0.9939
35	0.7114	2.0496	0.9492
	0.7422	1.8315	0.9600
	0.7370	1.8097	0.9596

and based on these analytical expressions, the following models can be obtained:

$$\sigma_{(0\%)}=3.0E\text{-}09\exp[5751.7/T]\dot{\gamma}_a^{\;0.9091} \tag{14}$$

$$\sigma_{(5\%)}=4.0E\text{-}07\exp[4317.4/T]\dot{\gamma}_a^{\;0.9091} \tag{15}$$

$$\sigma_{(15\%)}=7.0E\text{-}12\exp[7894.3/T]\dot{\gamma}_a^{\;0.9091} \tag{16}$$

$$\sigma_{(25\%)}=1.0E\text{-}11\exp[7981.6/T]\dot{\gamma}_a^{\;0.9091} \tag{17}$$

$$\sigma_{(35\%)}=9.0E\text{-}08\exp[5544.3/T]\dot{\gamma}_a^{\;0.9091} \tag{18}$$

The data modeled by Equations 14 to 18 are represented in the Figures 2 to 6, respectively. In each line of these figures the slope which represents the average apparent viscosity, is higher as the temperature decreases, which agrees with theory, since it is supposed that at a lower temperature the tendency to flow is lower.

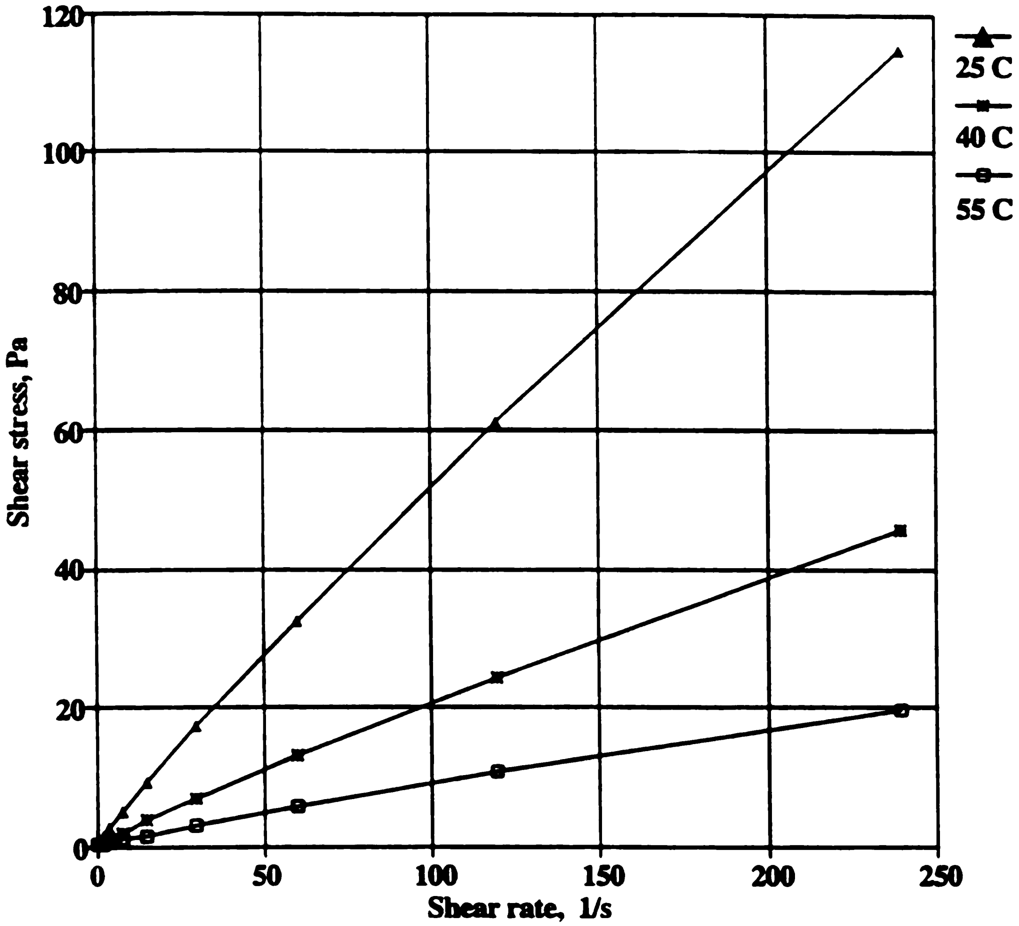

Figure 2. Influence of temperature on shear stress at 0% CaCO3

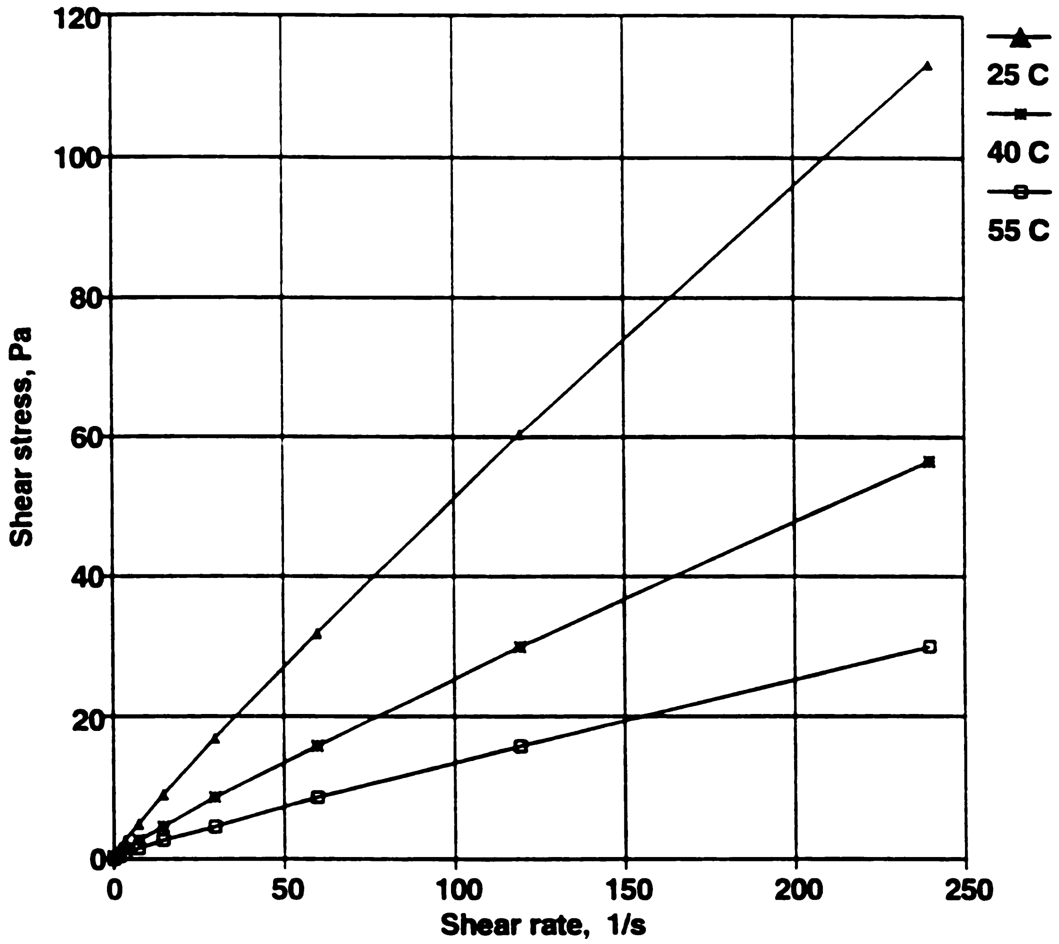

Figure 3. Influence of temperature on shear stress at 5% CaCO3

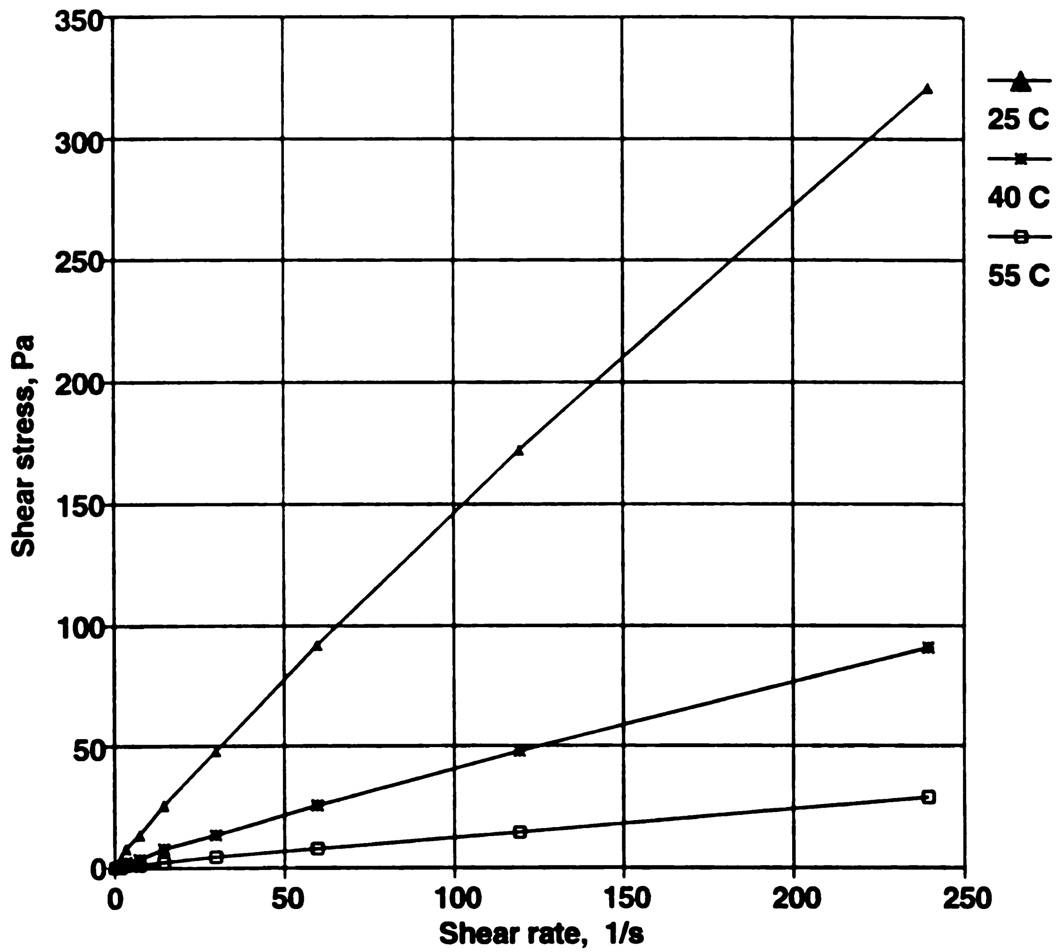

Figure 4. Influence of temperature on shear stress at 15%CaO3

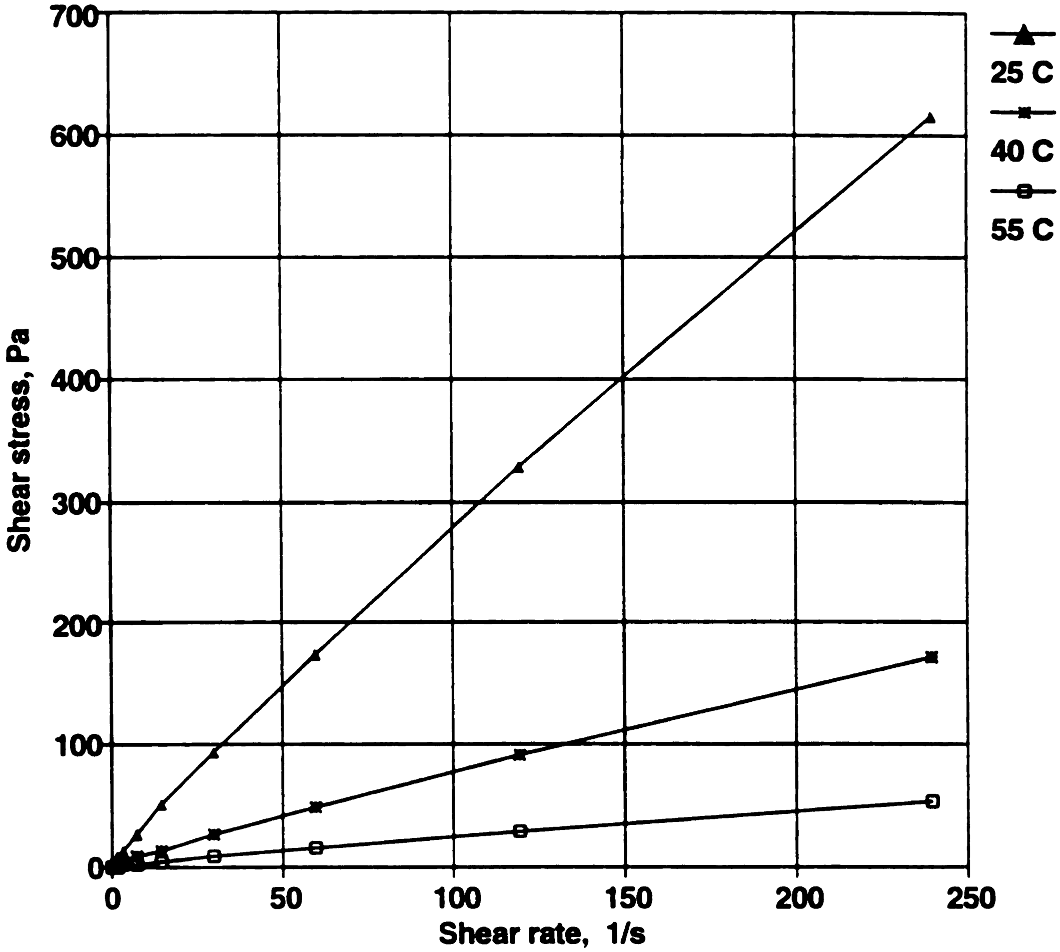

Figure 5. Influence of temperature on shear stress at 25% CaCO3

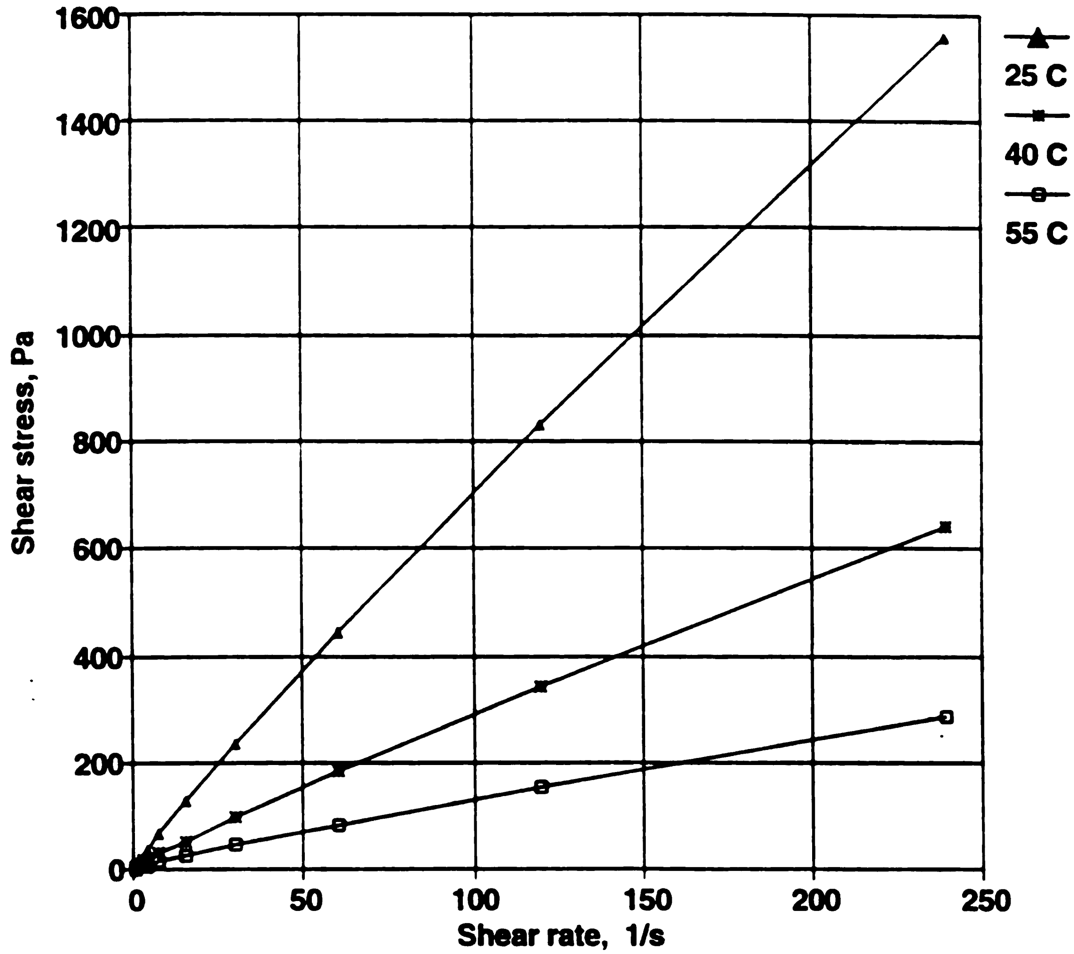

Figure 6. Influence of temperature on shear stress at 35% CaCO3

4.2. Concentration Effect at Each Temperature.

From the regression analysis of the different values of K and concentrations at constant temperatures (Tables 1 to 3) the following prediction equations for K_C have been obtained:

25°C: $\ln K_C = -0.268 + 0.0709\ C$ $R^2 = 0.9499$, number of observations = 19

40°C: $\ln K_C = -1.751 + 0.0874\ C$ $R^2 = 0.8638$, number of observations = 16

55°C: $\ln K_C = -1.993 + 0.054\ C$ $R^2 = 0.5616$, number of observations = 20

The predictions for the values of K_C are as follow:

25°C: $K_C = 0.7650 \exp(0.0709\ C)$

40°C: $K_C = 0.1736 \exp(0.0874\ C)$

55°C: $K_C = 0.1362 \exp(0.054\ C)$

and $\bar{n} = 0.9101$

and the final models are:

$$\sigma_{25^\circ C} = 0.7650 \exp(0.0709\ C)\ \dot{\gamma}_a^{0.9101} \qquad (19)$$

$$\sigma_{40^\circ C} = 0.1736 \exp(0.0874\ C)\ \dot{\gamma}_a^{0.9101} \qquad (20)$$

$$\sigma_{55^\circ C} = 0.1362 \exp(0.0540\ C)\ \dot{\gamma}_a^{0.9101} \qquad (21)$$

The Equations 19 to 21 are represented in the Figures 7 to 9, respectively. For each case, the slope which represents the average apparent viscosity is higher as the concentration increases, which again agrees with theory, since it is supposed that at a higher concentration the resistance to flow is greater.

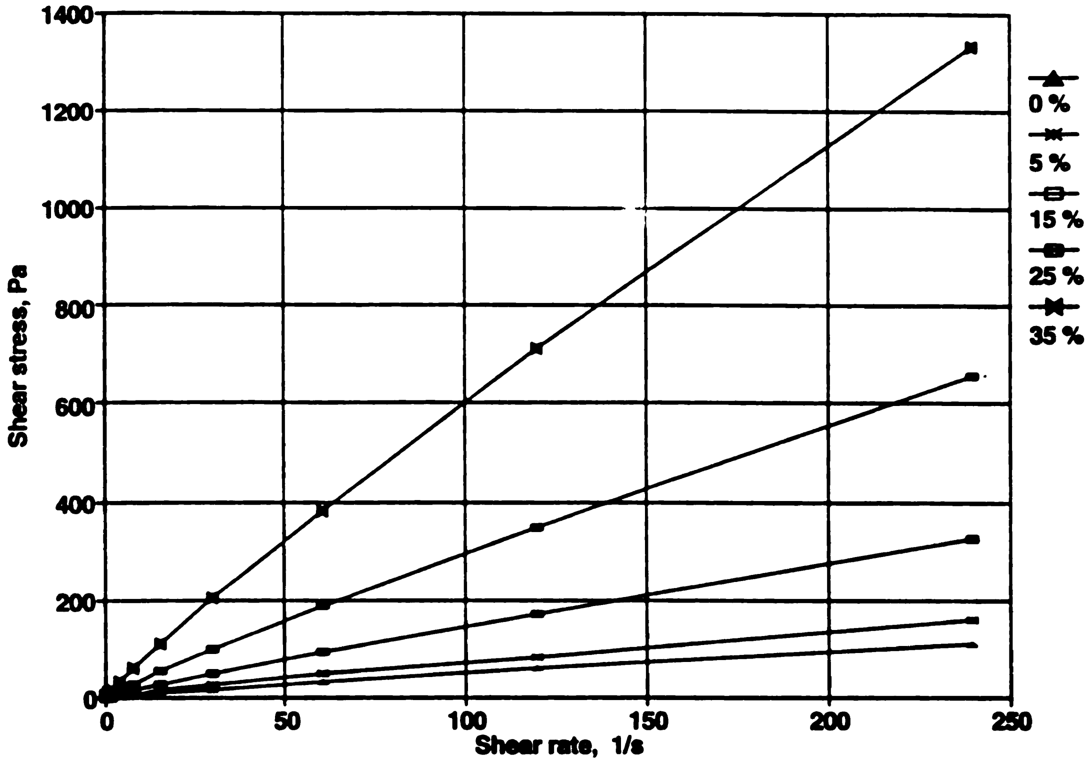

Figure 7. Influence of concentration on shear stress at 25 degrees Celsius.

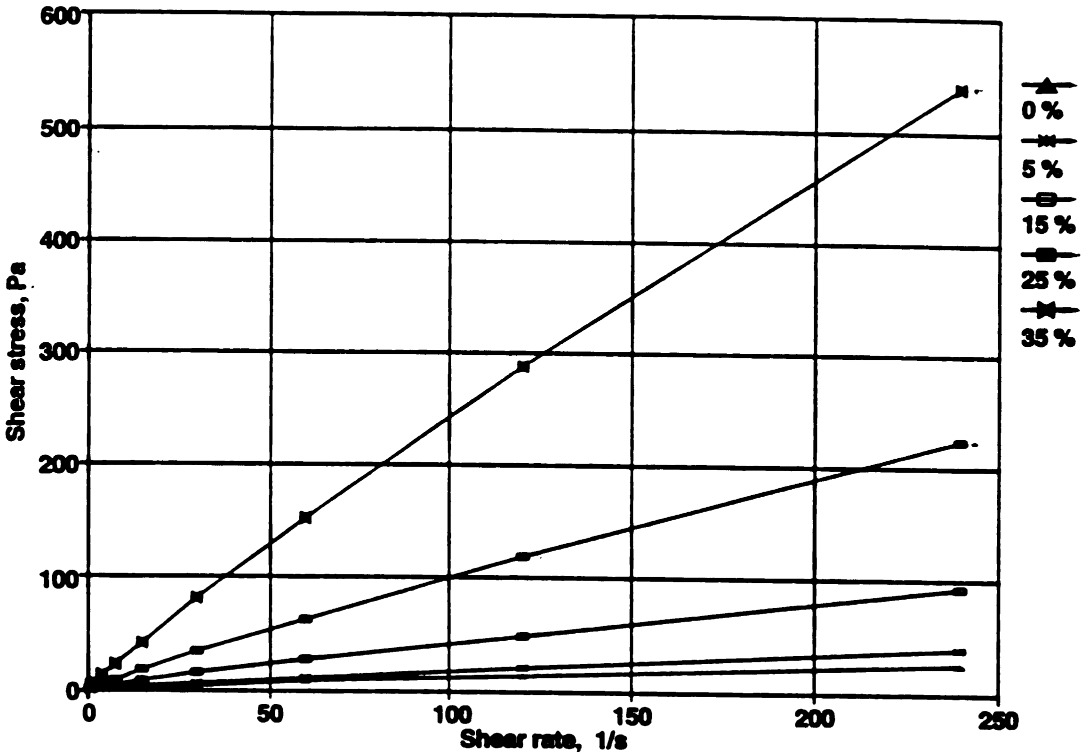

Figure 8. Influence of concentration on shear stress at 40 degrees Celsius.

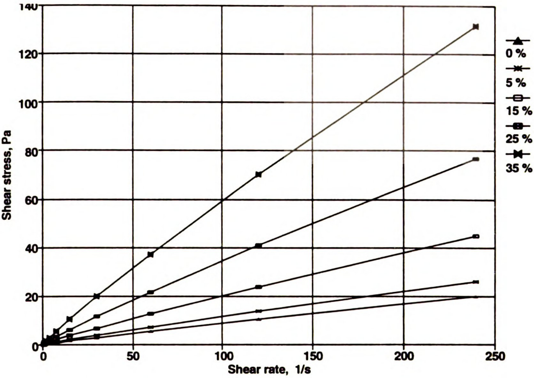

Figure 9. Influence of concentration on shear stress at 55 degrees Celsius.

4.3. Effect of Temperature and Concentration.

A non-linear model was obtained using SAS (1988) (Statistical Analysis System), by means of the non-linear procedure, NLIN. This procedure was used to get a predictive model which had all the main variables included. To fit a non-linear model a program was written, and the Marquardt method was used, where the variables, range and derivatives of parameters to be estimated must be specified. One of the variables was allowed to be a floating parameter, α. This parameter would then be compared with the experimental average flow behavior index ($\bar{n}$) to check out the accuracy of this estimation as a way of validating the obtained model.

The result of this modeling procedure using 512 data points (Appendix 1) including all the conditions of temperature, concentration and shear rate was:

$$\ln \sigma_a = -17.2338 + \frac{5078.4359}{T} + 0.0550\, C + 0.8896 \ln \dot{\gamma}_a \quad (22)$$

obtaining a goodness of fit $R^2 = 0.9588$. From this equation the final prediction equation was found to be:

$$\sigma_a = 3.3E{-}8 \exp\left[\frac{5078.4359}{T} + 0.0550\, C\right] \dot{\gamma}_a^{\,0.8896} \quad (23)$$

Hence, it is possible to obtain a predictive equation for the average apparent viscosity:

$$\mu_{avg\ app} = 3.3E{-}08 \exp\left[\frac{5078.4359}{T} + 0.0550\, C\right] \dot{\gamma}_a^{\,-0.1104} \quad (24)$$

4.4. Summary of Effects.

A summary of the parameters observed for each effect is presented in Table 4. It is demonstrated that with calcium carbonate-corn syrup mixtures, the higher the concentration, the lower the flow index behavior and the higher the consistency coefficient for the range of temperatures and concentrations under study.

The values of the consistency coefficient from Tables 1, 2 and 3 are represented in Figure 10. Here it is demonstrated in a three-dimensional plot that there is a very well known trend for the behavior of the consistency coefficient as concentration and temperature vary. This trend is fairly reasonable, it is expected that as concentration increases the value of the consistency coefficient should go up, and also as temperature increases the value of the consistency coefficient should go down.

The values of the flow behavior index from the Tables 1, 2 and 3 are represented in Figure 11. The flow behavior index also exhibits a trend, the higher the temperature the lower the flow behavior index, and the higher the concentration the lower the flow behavior index. Both trends are present for most of the values of the independent variables.

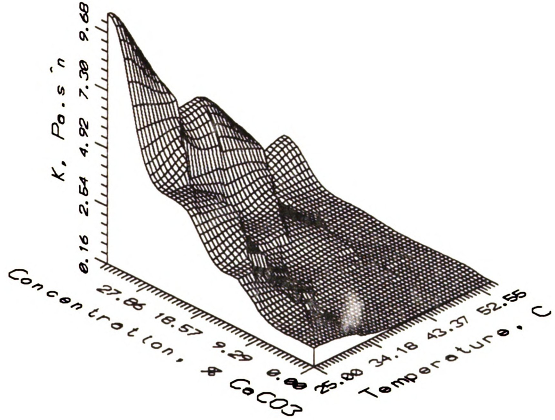

Figure 10. Effect of temperature and concentration on K.

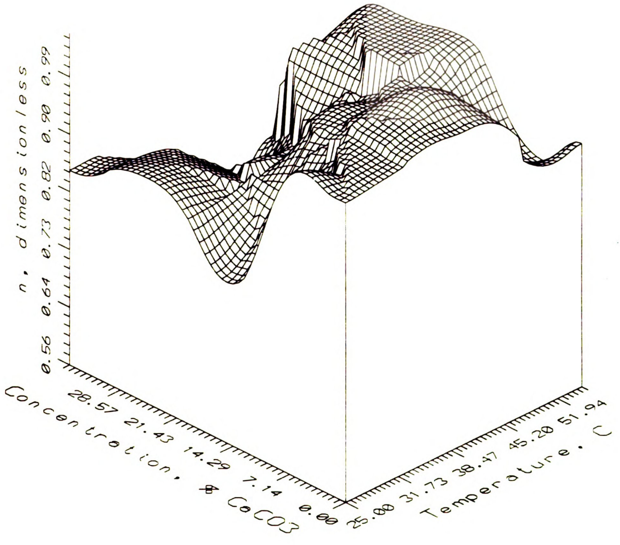

Figure 11. Effect of temperature and concentration on n.

Table 4. Summary of constants obtained from the three main effects under study.

T (°C)	C (weight %)	K (Pa s)	E_a/R (K)	B (1/weight %)	$\bar{n}$ or α (dimensionless)
25-55	0	3.0E-9	5751.7	-	$\bar{n}$ = 0.9101
25-55	5	4.0E-7	4317.4	-	$\bar{n}$ = 0.9101
25-55	15	7.0E-12	7894.3	-	$\bar{n}$ = 0.9101
25-55	25	1.0E-11	7981.6	-	$\bar{n}$ = 0.9101
25-55	35	9.0E-8	5544.3	-	$\bar{n}$ = 0.9101
25	0-35	0.765	-	0.0709	$\bar{n}$ = 0.9101
40	0-35	0.1736	-	0.0874	$\bar{n}$ = 0.9101
55	0-35	0.1362	-	0.0540	$\bar{n}$ = 0.9101
25-55	0-35	3.3E-8	5078.4	0.0550	α = 0.8896

Figure 12 is a representation of the predictive equation for the average apparent viscosity found for a shear rate value of 59.905 1/s, for different values of concentration and temperature. In this figure a trend is obvious. This is in agreement with the principle that the higher the concentration, the higher the viscosity at constant temperature, and the higher the temperature, the lower the average apparent viscosity at a constant concentration.

4.5. Use of Calcium Carbonate-Corn Syrup Mixture.

The goal of this work was to study calcium carbonate-corn syrup mixtures to determine if they could be used as shear-thinning standards in the food industry. This standard material did not present clear shear-thinning behavior. In others words, with the equipment used, it is not possible to find shear-thinning behavior which was statistically significant. Hence, this calcium carbonate-corn syrup mixture is not a suitable shear-thinning standard for the food industry.

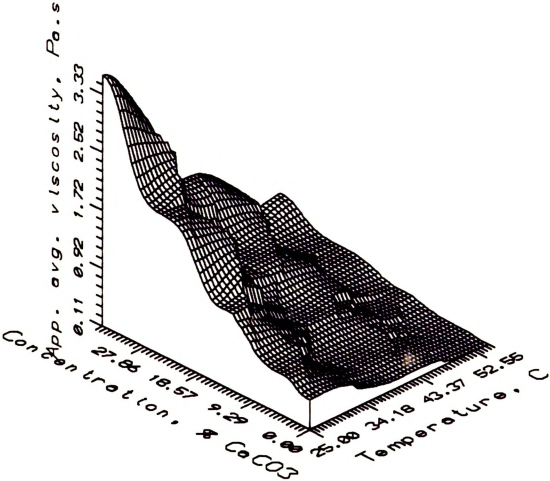

Figure 12. Effect of temperature and concentration on apparent viscosity at 59.905 s^{-1}

CHAPTER V

CONCLUSIONS

In Figures 2 to 6, which are the graphic representations of the Equations 14 to 18, it is demonstrated that the temperature effect at each concentration is fairly well represented with a power law model showing a general trend that the lower the temperature the higher the viscosity.

The Equations 19 to 21 are represented in the Figures 7 to 9 respectively, and here it is observed that the higher the concentrations yield higher viscosities.

From the combined effect of temperature and concentration on shear stress (Figure 12), it is possible to say that the average apparent viscosity decreases as the temperature increases at a constant concentration. On the other hand, at a constant temperature, the average apparent viscosity decreases as the concentration goes down.

The calcium carbonate-corn syrup mixture does not exhibit shear-thinning trends with changes in the calcium-carbonate concentration. Also, these mixtures do not show thixotropic behavior, but do exhibit a problematic settling phenomenon.

CHAPTER VI

FUTURE RESEARCH

A future interesting study would be to determine the influence that the particle size can have on the change of properties, in a system with Newtonian or non-Newtonian fluids, looking for any important dependency on the type of solid as well. For example, some kinds of polymers that are not soluble in the fluid could be investigated.

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VII. APPENDIX 1. PREDICTION OF AVERAGE APPARENT VISCOSITY at 59.905 1/s.

Predicted average apparent viscosity using the predictive equation, Equation (24)

Temperature °C	Concentration % CaCO3	K Pa s^n	n dimensionless	Apparent average viscosity Pa s	average shear stress Pa
25	0	0.9224	0.9560	0.5244	0.0216
25	0	1.2729	1.0032	0.5244	0.0216
25	0	0.6547	1.0568	0.5244	0.0216
25	5	1.1114	0.9581	0.6904	0.0285
25	5	1.1015	0.9662	0.6904	0.0285
25	5	0.6461	1.1338	0.6904	0.0285
25	15	2.3145	0.8045	1.1967	0.0493
25	15	2.3482	0.7653	1.1967	0.0493
25	15	2.0665	0.8237	1.1967	0.0493
25	25	3.7893	0.9520	2.0742	0.0854
25	25	4.2800	0.9085	2.0742	0.0854
25	25	4.2554	0.9067	2.0742	0.0854
25	25	4.3843	0.8848	2.0742	0.0854
25	25	4.1873	0.8673	2.0742	0.0854
25	35	4.2907	0.8479	2.0742	0.0854
25	35	9.3804	0.8152	3.5951	0.1482
25	35	11.2379	0.8283	3.5951	0.1482
25	35	10.7634	0.9022	3.5951	0.1482
40	0	0.3071	0.9394	0.2319	0.0096
40	0	0.1311	1.1640	0.2319	0.0096
40	0	0.2798	0.9737	0.2319	0.0096
40	5	0.2745	1.0205	0.3053	0.0125
40	5	0.4502	0.9911	0.3053	0.0125
40	5	0.1453	1.1581	0.3053	0.0125
40	15	0.4123	1.0136	0.5292	0.0218
40	15	0.3532	1.0567	0.5292	0.0218
40	15	0.8491	0.8416	0.5292	0.0218
40	25	2.2041	0.7528	0.9173	0.0378
40	25	0.7961	0.9147	0.9173	0.0378
40	25	1.254	0.8166	0.9173	0.0378
40	25	1.0246	0.8516	0.9173	0.0378
40	35	5.9571	0.5421	1.5899	0.0655
40	35	4.6503	0.5670	1.5899	0.0655
40	35	4.9264	0.5616	1.5899	0.0655
55	0	0.1295	0.9672	0.1105	0.0046
55	0	0.1896	0.8910	0.1105	0.0046
55	0	0.1653	0.9092	0.1105	0.0046
55	5	0.5706	0.6665	0.1455	0.0060
55	5	0.1244	1.0083	0.1455	0.0060
55	5	0.2039	0.9296	0.1455	0.0060
55	5	0.223	0.8681	0.1455	0.0060
55	15	0.2065	0.9798	0.2522	0.0104
55	15	0.2954	0.8935	0.2522	0.0104
55	15	0.1322	1.1106	0.2522	0.0104
55	25	0.4165	0.9624	0.4370	0.0180
55	25	0.1448	1.1952	0.4370	0.0180
55	25	0.3193	1.0069	0.4370	0.0180
55	25	0.5623	0.8711	0.4370	0.0180
55	25	0.5557	0.8745	0.4370	0.0180
55	25	0.2951	1.0345	0.4370	0.0180
55	25	0.4692	0.9092	0.4370	0.0180
55	35	2.0496	0.7114	0.7576	0.0312
55	35	1.8315	0.7422	0.7576	0.0312
55	35	1.8097	0.7370	0.7576	0.0312

VIII. APPENDIX 2. MEASUREMENTS PERFORMED AT 25°C.

This appendix contains all the raw data and a summary of the basic calculations done based on the average of the measurements, keeping in mind that the maximum torque value was equal to 1.428716915 N cm.

1.- Mixer Viscometry, 0%, 0 g corn syrup

rpm	readings								Average
1	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
2	0.7	0.7	0.7	0.7	0.7	0.6	0.7	0.7	0.6875
4	1.3	1.2	1.3	1.2	1.3	1.2	1.2	1.3	1.25
8	2.5	2.4	2.5	2.4	2.6	2.4	2.5	2.4	2.4625
16	4.9	4.8	4.7	4.6	5	4.8	4.8	4.7	4.7875
32	9.6	9.6	9.5	9.6	9.6	9.5	9.6	9.5	9.5625
64	19.1	19	19	19.1	19	19.1	19	19	19.0375
128	37.9	37.9	37.9	37.9	37.9	37.8	37.8	37.8	37.8625
256	74.9	74.9	75	74.9	75	74.9	74.9	74.9	74.925
128	32.9	32.9	32.9	32.9	32.9	32.8	32.9	32.9	32.8875
64	18	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.0875
32	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
16	5	5	5	4.9	5	4.9	5	4.9	4.9625
8	2.6	2.7	2.7	2.6	2.6	2.6	2.6	2.6	2.625
4	1.4	1.5	1.4	1.4	1.4	1.4	1.4	1.5	1.425
2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
1	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.5125

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.00571	6E-05	-0.9801	-4.243
2	0.2094	0.00982	1E-04	-0.679	-4.008
4	0.4188	0.01786	0.0002	-0.378	-3.748
8	0.8376	0.03518	0.0004	-0.077	-3.454
16	1.6752	0.0684	0.0007	0.22407	-3.165
32	3.3504	0.13662	0.0014	0.5251	-2.864
64	6.7008	0.27199	0.0027	0.82613	-2.565
128	13.402	0.54095	0.0054	1.12716	-2.267
256	26.803	1.07047	0.0107	1.42819	-1.97
128	13.402	0.46987	0.0047	1.12716	-2.328
64	6.7008	0.25842	0.0026	0.82613	-2.588
32	3.3504	0.13573	0.0014	0.5251	-2.867
16	1.6752	0.0709	0.0007	0.22407	-3.149
8	0.8376	0.0375	0.0004	-0.077	-3.426
4	0.4188	0.02036	0.0002	-0.378	-3.691
2	0.2094	0.01143	0.0001	-0.679	-3.942
1	0.1047	0.00732	7E-05	-0.9801	-4.135

Determination of average shear rate

shear rate = 4.47 angular velocity   b = 0.02692 m

viscosity = K shear rate ^ (n-1)   d = 0.04143 m

K= consistency coefficient

k'=4.47

average shear stress = 2 M / pi b d^2

(b/d + 1/3) 0.9831

rpm	angular velocit rad/s	KG^(n-1) average viscosi Pa.s	average shear rate	X average shear stress	Lnshear stress	Lnshear rate	Sigma/ Gamma averag viscos Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	1.1675	0.46801	0.7874	-0.2391	-0.759	1.682	0.50297	-0.6872
2	0.2094	1.1063	0.93602	1.3533	0.30255	-0.066	1.446	0.86448	-0.1456
4	0.4188	1.0483	1.87204	2.4605	0.90038	0.627	1.314	1.57178	0.45221
8	0.8376	0.9933	3.74407	4.8473	1.57842	1.3202	1.295	3.0964	1.13024
16	1.6752	0.9412	7.48814	9.4239	2.24325	2.0133	1.259	6.01991	1.79507
32	3.3504	0.8919	14.9763	18.823	2.93509	2.7065	1.257	12.0241	2.48691
64	6.7008	0.8451	29.9526	37.474	3.62365	3.3996	1.251	23.9382	3.17547
128	13.402	0.8008	59.9052	74.53	4.3112	4.0928	1.244	47.6091	3.86302
256	26.803	0.7588	119.81	147.49	4.99373	4.7859	1.231	94.2123	4.54555

1/3 term included

Regression Output:		K
Constant	-0.0786	0.9244
Std Err of Y Est	0.06282	
R Square	0.99895	
Observations	9	
Degrees of Freedom	7	
X Coefficien	0.956	
Std Err of C	0.0117	

Model : Ln s. stress = -0.079 + 0.956 s.rate   R^2 = 0.99895

s.stress = 0.9244. s.rate ^ 0.956

2.- Mixer Viscometry, 0%, 0 g corn syrup

rpm	readings								Average
1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
2	0.6	0.5	0.6	0.6	0.5	0.6	0.6	0.5	0.5625
4	1.1	1.2	1.2	1.1	1.2	1.1	1.2	1.2	1.1625
8	2.2	2.4	2.3	2.4	2.4	2.4	2.3	2.3	2.3375
16	4.7	4.6	4.6	4.7	4.7	4.8	4.9	5	4.75
32	9.5	9.6	9.6	9.5	9.7	9.7	9.5	9.6	9.5875
64	19	19.1	19.1	19.1	19	19.1	19.2	19.1	19.0875
128	37.9	37.9	37.9	37.9	37.9	37.9	38	37.9	37.9125
256	75	75.1	75.1	75	75	74.7	74.8	74.8	74.9375
128	33	33	32.9	33	33	32.9	33	32.9	32.9625
64	17.9	18	17.9	18	18	17.9	17.9	18	17.95
32	9.3	9.4	9.3	9.4	9.3	9.4	9.3	9.4	9.35
16	4.9	4.8	4.7	4.8	4.8	4.8	4.9	4.8	4.8125
8	2.5	2.4	2.5	2.4	2.4	2.5	2.4	2.5	2.45
4	1.3	1.2	1.2	1.3	1.3	1.2	1.2	1.3	1.25
2	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6875
1	0.4	0.3	0.4	0.3	0.3	0.3	0.4	0.4	0.35

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.00429	4E-05	-0.9801	-4.368
2	0.2094	0.00804	8E-05	-0.679	-4.095
4	0.4188	0.01661	0.0002	-0.378	-3.78
8	0.8376	0.0334	0.0003	-0.077	-3.476
16	1.6752	0.06786	0.0007	0.22407	-3.168
32	3.3504	0.13698	0.0014	0.5251	-2.863
64	6.7008	0.27271	0.0027	0.82613	-2.564
128	13.402	0.54166	0.0054	1.12716	-2.266
256	26.803	1.07064	0.0107	1.42819	-1.97
128	13.402	0.47094	0.0047	1.12716	-2.327
64	6.7008	0.25645	0.0026	0.82613	-2.591
32	3.3504	0.13359	0.0013	0.5251	-2.874
16	1.6752	0.06876	0.0007	0.22407	-3.163
8	0.8376	0.035	0.0004	-0.077	-3.456
4	0.4188	0.01786	0.0002	-0.378	-3.748
2	0.2094	0.00982	1E-04	-0.679	-4.008
1	0.1047	0.005	5E-05	-0.9801	-4.301

Determination of average shear rate
shear rate = 4.47 angular velocity
viscosity = K shear rate ^(n-1)
k'=4.47 K=coef oof consist
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

			d^2b	KG^(n-1)			Sigma/ Gamma	1/3	Ln 1/3
	angular velocit	average shear	average shear	average viscosi	Lnshear	Lnshear	average viscos	average shear	average shear
rpm	rad/s	rate	stress	Pa.s	stress	rate	Pa.s	stress	stress
1	0.1047	0.468	0.59053	0.9318	-0.5267	-0.759	1.262	0.37723	-0.9749
2	0.2094	0.936	1.10725	0.9172	0.10188	-0.066	1.183	0.7073	-0.3463
4	0.4188	1.872	2.28831	0.9028	0.82781	0.627	1.222	1.46175	0.37964
8	0.8376	3.7441	4.60122	0.8886	1.52632	1.3202	1.229	2.93922	1.07815
16	1.6752	7.4881	9.35007	0.8747	2.23538	2.0133	1.249	5.97275	1.78721
32	3.3504	14.976	18.8724	0.861	2.9377	2.7065	1.26	12.0555	2.48952
64	6.7008	29.953	37.5725	0.8475	3.62627	3.3996	1.254	24.001	3.1781
128	13.402	59.905	74.6283	0.8342	4.31252	4.0928	1.246	47.672	3.86434
256	26.803	119.81	147.51	0.8211	4.99389	4.7859	1.231	94.228	4.54572
					y			x	

Regression Statistics

R Square	0.9999
Observations	9

		Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K =1.2729	Interce	0.24127	0.0096	25.0269	7E-09	0.218	0.26406
	x1	0.99669	0.0038	261.245	5E-17	0.988	1.00571

3.- Mixer Viscometry, 0%, 0 g corn syrup

rpm	readings								Average
1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
4	1.1	1.1	1	1.1	1.1	1.1	1	1	1.0625
8	2.3	2.3	2.2	2.3	2.3	2.2	2.2	2.2	2.25
16	4.6	4.7	4.6	4.7	4.8	4.8	4.6	4.7	4.6875
32	9.5	9.4	9.6	9.5	9.4	9.4	9.6	9.5	9.4875
64	19.1	19.1	19	19	19	19	19	19.1	19.0375
128	38	38	38	38	38	38.1	38	38.1	38.025
256	75.5	75.8	75.9	75.8	75.8	75.8	75.7	75.7	75.75
128	38.2	38.1	38.1	38.1	38.1	38.1	38.1	38.2	38.125
64	19.1	19	19.1	19.1	19.1	19	19.1	19	19.0625
32	9.5	9.5	9.6	9.4	9.5	9.4	9.5	9.5	9.4875
16	4.6	4.7	4.7	4.8	4.7	4.7	4.6	4.7	4.6875
8	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.2875
4	1.1	1	1	1.1	1.1	1.1	1	1.1	1.0625
2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

rpm	rad/s omega	(N cm) M	(N m) M	Log Om	Log M
1	0.1047	0.00286	3E-05	-0.9801	-4.544
2	0.2094	0.00714	7E-05	-0.679	-4.146
4	0.4188	0.01518	0.0002	-0.378	-3.819
8	0.8376	0.03215	0.0003	-0.077	-3.493
16	1.6752	0.06697	0.0007	0.22407	-3.174
32	3.3504	0.13555	0.0014	0.5251	-2.868
64	6.7008	0.27199	0.0027	0.82613	-2.565
128	13.402	0.54327	0.0054	1.12716	-2.265
256	26.803	1.08225	0.0108	1.42819	-1.966
128	13.402	0.5447	0.0054	1.12716	-2.264
64	6.7008	0.27235	0.0027	0.82613	-2.565
32	3.3504	0.13555	0.0014	0.5251	-2.868
16	1.6752	0.06697	0.0007	0.22407	-3.174
8	0.8376	0.03268	0.0003	-0.077	-3.486
4	0.4188	0.01518	0.0002	-0.378	-3.819
2	0.2094	0.00714	7E-05	-0.679	-4.146
1	0.1047	0.00286	3E-05	-0.9801	-4.544

Determination of average shear rate
average shear rate = 4.47 angular velocity
viscosity = K shear rate ^ (n-1) b = 0.02692 m
k'=4.47 d = 0.04143 m
K= consistency coefficient
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

rpm	angular velocit rad/s	average shear rate	KG^(n-1) average viscosi Pa.s	average shear stress	Lnshear stress	Lnshear rate	Sigma/ Gamma average viscosi Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	0.468	0.68023	0.3937	-0.9322	-0.759	0.841	0.25148	-1.3804
2	0.2094	0.936	0.71108	0.9842	-0.0159	-0.066	1.051	0.62871	-0.4641
4	0.4188	1.872	0.74334	2.0915	0.73786	0.627	1.117	1.33601	0.28969
8	0.8376	3.7441	0.77706	4.429	1.48817	1.3202	1.183	2.8292	1.03999
16	1.6752	7.4881	0.8123	9.227	2.22214	2.0133	1.232	5.89416	1.77396
32	3.3504	14.976	0.84915	18.676	2.92721	2.7065	1.247	11.9298	2.47904
64	6.7008	29.953	0.88767	37.474	3.62365	3.3996	1.251	3.9382	3.17547
128	13.402	59.905	0.92793	74.85	4.31548	4.0928	1.249	47.8135	3.86731
256	26.803	119.81	0.97002	149.11	5.00468	4.7859	1.245	95.2497	4.5565
						x			y

Regression Statistics

R Square	0.99858
Observations	9

		Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K =0.6547	Interce	-0.4236	0.0406	-10.428	6E-06	-0.52	-0.3275
	x1	1.05683	0.0151	70.0891	2E-12	1.021	1.09248

4.- Mixer Viscometry, 5%, 4.99%, 60.11 g corn syrup, 3 g CaCO3

rpm	readings								Average
1	0.4	0.5	0.4	0.5	0.4	0.4	0.4	0.4	0.425
2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
4	1.6	1.6	1.6	1.6	1.7	1.6	1.6	1.6	1.6125
8	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.15
16	6.2	6.1	6.1	6.1	6.1	6.1	6.1	6.2	6.125
32	12.2	12.2	12.1	12.2	12.1	12.2	12.1	12.1	12.15
64	24	24.1	24.1	24	24.1	24	24	24.1	24.05
128	47.2	47.3	47.2	47.2	47.2	47.2	47.2	47.1	47.2
256	78	77.9	78	78.1	78.3	78.3	78.4	78.5	78.1875
128	43	42.9	43	42.9	42.9	42.9	42.9	42.8	42.9125
64	22.6	22.5	22.5	22.5	22.5	22.6	22.5	22.6	22.5375
32	11.8	11.9	11.8	11.8	11.8	11.9	11.9	11.8	11.8375
16	6.1	6.1	6	6.1	6	6	6	6.1	6.05
8	3.1	3.1	3	3.1	3.1	3.1	3	3.1	3.075
4	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.5	1.475
2	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3

rpm	rad/s omega	(N cm) M	(N m) M	Log Om	Log M
1	0.1047	0.00607	6E-05	-0.9801	-4.217
2	0.2094	0.01143	0.0001	-0.679	-3.942
4	0.4188	0.02304	0.0002	-0.378	-3.638
8	0.8376	0.045	0.0005	-0.077	-3.347
16	1.6752	0.08751	0.0009	0.22407	-3.058
32	3.3504	0.17359	0.0017	0.5251	-2.76
64	6.7008	0.34361	0.0034	0.82613	-2.464
128	13.402	0.67435	0.0067	1.12716	-2.171
256	26.803	1.11708	0.0112	1.42819	-1.952
128	13.402	0.6131	0.0061	1.12716	-2.212
64	6.7008	0.322	0.0032	0.82613	-2.492
32	3.3504	0.16912	0.0017	0.5251	-2.772
16	1.6752	0.08644	0.0009	0.22407	-3.063
8	0.8376	0.04393	0.0004	-0.077	-3.357
4	0.4188	0.02107	0.0002	-0.378	-3.676
2	0.2094	0.01	0.0001	-0.679	-4
1	0.1047	0.00429	4E-05	-0.9801	-4.368

Determination of average shear rate
average shear rate = 4.47 k'
viscosity = K shear rate ^(n 1)
K = consistency coefficient
k'=4.47
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

b = 0.02692 m
d = 0.04143 m

rpm	angular velocit rad/s	KG^(n-1) average viscisi Pa.s	average shear rate	average shear stress	Lnshear stress	Lnshear rate	Sigma/ Gamma average viscosi Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	1.1281	0.46801	0.8366	0.1784	-0.7593	1.7875	0.534	-0.6266
2	0.2094	1.1151	0.93602	1.5747	0.4541	-0.0661	1.6824	1.006	0.00592
4	0.4188	1.1023	1.87204	3.1741	1.15503	0.62703	1.6955	2.028	0.70685
8	0.8376	1.0896	3.74407	6.2006	1.82464	1.32017	1.6561	3.961	1.37647
16	1.6752	1.0771	7.48814	12.057	2.48962	2.01332	1.6101	7.702	2.04144
32	3.3504	1.0647	14.9763	23.917	3.17457	2.70647	1.597	15.28	2.72639
64	6.7008	1.0524	29.9526	47.341	3.85737	3.39962	1.5805	30.24	3.4092
128	13.402	1.0403	59.9052	92.91	4.53163	4.09276	1.551	59.35	4.08346
256	26.803	1.0283	119.81	153.91	5.03635	4.78591	1.2846	98.31	4.58817
						x			y

Regression Statistics

R Square	0.99932
Observations	9

		Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K =1.1114	Interce	0.10562	0.0255	4.13761	0.0033	0.045	0.16598
	x1	0.9581	0.0095	101.105	1E-13	0.936	0.98051

5.- Mixer Viscometry, 5%, 5%, 60.84 g corn syrup, 3,04 g CaCO3

rpm	readings								Average
1	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
2	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8125
4	1.6	1.6	1.7	1.6	1.6	1.7	1.6	1.6	1.625
8	3.3	3.1	3.2	3.1	3.1	3.1	3.2	3.2	3.1625
16	6.3	6.3	6.4	6.2	6.3	6.3	6.3	6.3	6.3
32	12.5	12.4	12.4	12.5	12.5	12.5	12.4	12.4	12.45
64	24.7	24.7	24.7	24.7	24.7	24.7	24.6	24.7	24.6875
128	47.2	47.3	47.2	47.2	47.3	47.3	47.3	47.3	47.2625
256	79.3	79.2	79.6	79.6	80.1	80.4	80.1	79.8	79.7625
128	42.9	42.9	42.8	42.8	42.9	42.9	42.8	42.9	42.8625
64	22.9	22.9	22.9	22.8	22.9	22.8	22.9	22.9	22.875
32	12.2	12.3	12.2	12.2	12.2	12.2	12.3	12.2	12.225
16	6.4	6.4	6.4	6.4	6.4	6.5	6.4	6.5	6.425
8	3.3	3.3	3.2	3.3	3.4	3.3	3.4	3.3	3.3125
4	1.7	1.7	1.8	1.8	1.7	1.7	1.8	1.8	1.75
2	0.9	0.9	1	1	1	0.9	0.9	1	0.95
1	0.6	0.5	0.5	0.6	0.5	0.5	0.6	0.6	0.55

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.00571	6E-05	-0.9801	-4.243
2	0.2094	0.01161	0.0001	-0.679	-3.935
4	0.4188	0.02322	0.0002	-0.378	-3.634
8	0.8376	0.04518	0.0005	-0.077	-3.345
16	1.6752	0.09001	0.0009	0.22407	-3.046
32	3.3504	0.17788	0.0018	0.5251	-2.75
64	6.7008	0.35271	0.0035	0.82613	-2.453
128	13.402	0.67525	0.0068	1.12716	-2.171
256	26.803	1.13958	0.0114	1.42819	-1.943
128	13.402	0.61238	0.0061	1.12716	-2.213
64	6.7008	0.32682	0.0033	0.82613	-2.486
32	3.3504	0.17466	0.0017	0.5251	-2.758
16	1.6752	0.0918	0.0009	0.22407	-3.037
8	0.8376	0.04733	0.0005	-0.077	-3.325
4	0.4188	0.025	0.0003	-0.378	-3.602
2	0.2094	0.01357	0.0001	-0.679	-3.867
1	0.1047	0.00786	8E-05	-0.9801	-4.105

Determination of average shear rate
averageshear rate = 4.47 k'
viscosity = K shear rate^(n-1)
k'=4.47
k= consistency coefficient
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

b = 0.02692 m
d = 0.04143 m

rpm	angular velocit rad/s	KG^(n-1) average viscosi Pa.s	average shear rate	average shear stress	Lnshear stress	Lnshear rate	Sigma/ Gamma average viscos Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	1.3635	0.46801	0.7874	-0.2391	-0.759	1.682	0.50297	-0.6872
2	0.2094	1.3086	0.93602	1.5994	0.4696	-0.066	1.709	1.02166	0.02142
4	0.4188	1.2559	1.87204	3.1987	1.16275	0.627	1.709	2.04331	0.71457
8	0.8376	1.2053	3.74407	6.2252	1.8286	1.3202	1.663	3.9766	1.38043
16	1.6752	1.1568	7.48814	12.401	2.51779	2.0133	1.656	7.92176	2.06961
32	3.3504	1.1102	14.9763	24.507	3.19896	2.7065	1.636	15.6549	2.75078
64	6.7008	1.0655	29.9526	48.596	3.88354	3.3996	1.622	31.0426	3.43536
128	13.402	1.0226	59.9052	93.033	4.53296	4.0928	1.553	59.4289	4.08478
256	26.803	0.9814	119.81	157.01	5.05629	4.7859	1.31	100.295	4.60812
						x			y

Regression Statistics
R Square 0.99919
Observations 9

		Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K =1.1015	Interce	0.0967	0.0281	3.44444	0.0088	0.03	0.16309
	x1	0.96621	0.0104	92.7094	2E-13	0.942	0.99085

6.- Mixer Viscometry, 5%, 5%, 90.23 g corn syrup, 4.51 g CaCO3 Sample in storing

rpm		readings							Average
1	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1375
2	0.5	0.5	0.5	0.6	0.5	0.6	0.5	0.5	0.525
4	1.2	1.3	1.3	1.3	1.2	1.3	1.3	1.2	1.2625
8	2.7	2.9	2.8	2.8	2.7	2.9	2.8	2.9	2.8125
16	5.9	6	5.9	5.9	6	5.9	5.9	6	5.9375
32	12.1	12.1	12	12	12.1	12.1	12	12.1	12.0625
64	24.4	24.3	24.4	24.3	24.4	24.4	24.3	24.4	24.3625
128	48.7	48.6	48.7	48.7	48.7	48.7	48.7	48.7	48.6875
256	95.6	95.7	98.1	95.5	95.5	95.5	95.5	95.5	95.8625
128	48.5	48.6	48.5	48.5	48.6	48.5	48.6	48.5	48.5375
64	24.3	24.3	24.2	24.3	24.4	24.3	24.3	24.3	24.3
32	12.1	12	12.1	12.2	12.1	12.1	12.2	12.1	12.1125
16	6	5.9	5.9	6	5.9	5.9	5.9	6	5.9375
8	2.9	2.9	3	2.8	2.9	3	2.9	2.9	2.9125
4	1.4	1.4	1.5	1.4	1.3	1.4	1.5	1.4	1.4125
2	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.7	0.625
1	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.3	0.2625

rpm	rad/s omega	(N cm) M	(N m) M	Log Om	Log M
1	0.1047	0.00196	2E-05	-0.9801	-4.707
2	0.2094	0.0075	8E-05	-0.679	-4.125
4	0.4188	0.01804	0.0002	-0.378	-3.744
8	0.8376	0.04018	0.0004	-0.077	-3.396
16	1.6752	0.08483	0.0008	0.22407	-3.071
32	3.3504	0.17234	0.0017	0.5251	-2.764
64	6.7008	0.34807	0.0035	0.82613	-2.458
128	13.402	0.69561	0.007	1.12716	-2.158
256	26.803	1.3696	0.0137	1.42819	-1.863
128	13.402	0.69346	0.0069	1.12716	-2.159
64	6.7008	0.34718	0.0035	0.82613	-2.459
32	3.3504	0.17305	0.0017	0.5251	-2.762
16	1.6752	0.08483	0.0008	0.22407	-3.071
8	0.8376	0.04161	0.0004	-0.077	-3.381
4	0.4188	0.02018	0.0002	-0.378	-3.695
2	0.2094	0.00893	9E-05	-0.679	-4.049
1	0.1047	0.00375	4E-05	-0.9801	-4.426

Determination of average shear rate
average shear rate = 4.47 angular velocity
viscosity = K shear rate ^(n=1)   b = 0.02692 m
k'=4.47   d = 0.04143 m
k = consistency coefficient
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

rpm	angular velocit rad/s	KG^(n-1) average viscosi Pa.s	average shear rate	average shears stress	Lnshear stress	Lnshear rate	Sigma/ Gamma average viscosi Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	0.744	0.46801	0.2707	-1.3069	-0.759	0.578	0.1729	-1.7551
2	0.2094	0.7981	0.93602	1.0334	0.03288	-0.066	1.104	0.66015	-0.4153
4	0.4188	0.8562	1.87204	2.4852	0.91033	0.627	1.328	1.5875	0.46216
8	0.8376	0.9186	3.74407	5.5362	1.71131	1.3202	1.479	3.5365	1.26314
16	1.6752	0.9855	7.48814	11.688	2.45853	2.0133	1.561	7.46594	2.01035
32	3.3504	1.0572	14.9763	23.744	3.16734	2.7065	1.585	15.1677	2.71916
64	6.7008	1.1342	29.9526	47.956	3.87028	3.3996	1.601	30.6339	3.42211
128	13.402	1.2168	59.9052	95.838	4.56266	4.0928	1.6	61.2207	4.11449
256	26.803	1.3054	119.81	188.7	5.24015	4.7859	1.575	120.54	4.79198
						x			y

Regression Statistics

R Square	0.98993
Observations	9

		Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K =0.6461	Interce	-0.4368	0.1164	-3.7527	0.0056	-0.71	-0.1616
	x1	1.1338	0.0432	26.2387	5E-09	1.032	1.23598

7.- Mixer Viscometry, 15%, 60.72 g corn syrup, 9.11 g CaCO3

rpm	readings								Average
1	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
2	1.6	1.6	1.5	1.5	1.6	1.5	1.6	1.6	1.5625
4	2.8	2.9	2.9	2.8	2.8	2.8	2.8	2.8	2.825
8	5.3	5.3	5.2	5.3	5.3	5.2	5.3	5.2	5.2625
16	10.2	10.2	10.3	10.2	10.2	10.1	10.2	10.2	10.2
32	20.3	20.2	20.1	20.1	20.1	20.1	20.2	20.1	20.15
64	39.6	39.5	39.7	39.5	39.5	39.6	39.9	39.5	39.6
128	77	77	77	77.3	77.1	77	77	77	77.05
64	39.6	39.7	39.6	39.6	39.5	39.5	39.8	39.8	39.6375
32	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2
16	10.3	10.3	10.3	10.5	10.4	10.3	10.3	10.3	10.3375
8	5.4	5.4	5.4	5.3	5.3	5.4	5.4	5.4	5.375
4	2.9	2.9	3	2.9	3	3	2.9	2.9	2.9375
2	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.625
1	1	1	1	1	1	1	1	1	1

rpm	rad/s omega	(N cm) M	(N m) M	Log Om	Log M
1	0.1047	0.01286	0.0001	-0.9801	-3.891
2	0.2094	0.02232	0.0002	-0.679	-3.651
4	0.4188	0.04036	0.0004	-0.378	-3.394
8	0.8376	0.07519	0.0008	-0.077	-3.124
16	1.6752	0.14573	0.0015	0.22407	-2.836
32	3.3504	0.28789	0.0029	0.5251	-2.541
64	6.7008	0.56577	0.0057	0.82613	-2.247
128	13.402	1.10083	0.011	1.12716	-1.958
256	26.803	0.56631	0.0057	1.42819	-2.247
128	13.402	0.2886	0.0029	1.12716	-2.54
64	6.7008	0.14769	0.0015	0.82613	-2.831
32	3.3504	0.07679	0.0008	0.5251	-3.115
16	1.6752	0.04197	0.0004	0.22407	-3.377
8	0.8376	0.02322	0.0002	-0.077	-3.634
4	0.4188	0.01429	0.0001	-0.378	-3.845

Determination of average shear rate
average shear rate = 4.47 angular velocity   b = 0.02692 m
viscosity = K shear rate^(n-1)   d = 0.04143 m
k'=4.47
K= consistency coefficient
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

rpm	angular velocit rad/s	KG^(n-1) average viscosi Pa.s	average shear rate	average shear stress	Lnshear stress	Lnshear rate	Sigma/ Gamma average viscosi Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	2.0248	0.46801	1.7716	0.57188	-0.759	3.785	1.13168	0.1237
2	0.2094	1.7434	0.93602	3.0757	1.12353	-0.066	3.286	1.96472	0.67535
4	0.4188	1.5011	1.87204	5.5608	1.71575	0.627	2.97	3.55222	1.26757
8	0.8376	1.2925	3.74407	10.359	2.33785	1.3202	2.767	6.61718	1.88967
16	1.6752	1.1128	7.48814	20.078	2.99963	2.0133	2.681	12.8257	2.55145
32	3.3504	0.9581	14.9763	39.664	3.68044	2.7065	2.648	25.337	3.23227
64	6.7008	0.825	29.9526	77.95	4.35607	3.3996	2.602	49.7939	3.90789
128	13.402	0.7103	59.9052	151.67	5.02169	4.0928	2.532	96.8843	4.57352
256	26.803	0.6116	119.81	78.024	4.35702	4.7859	0.651	49.8411	3.90884
					x				y

Regression Statistics

R Square	0.94913
Observations	9

		Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K =2.3145	Interce	0.8392	0.1896	4.4253	0.0022	0.391	1.28762
	x1	0.8045	0.0704	11.428	3E-06	0.638	0.97097

8.- Mixer Viscometry, 15%, 15%, 61.4 g corn syrup THIS IS THE FIRST WITH THE SAMPLE 9.19 g $CaCO_3$

rpm	readings								Average
1	1	1	1	1	1	1	1	1	1
2	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
4	2.7	2.7	2.8	2.7	2.7	2.8	2.7	2.7	2.725
8	4.9	4.9	4.9	5	4.9	5	4.9	4.9	4.925
16	9.3	9.2	9.2	9.2	9.3	9.2	9.3	9.2	9.2375
32	17.9	17.8	17.8	17.8	17.7	17.8	17.8	17.8	17.8
64	34.8	34.7	34.7	34.8	34.8	34.8	34.8	34.8	34.775
128	68.2	68.2	68.3	68.1	68.2	68.1	68.2	68.1	68.175
64	34.8	34.8	34.7	34.8	34.7	34.8	34.8	34.8	34.775
32	17.7	17.6	17.7	17.6	17.7	17.6	17.7	17.7	17.6625
16	9	8.9	8.9	8.9	9	8.9	9	8.9	8.9375
8	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
1	0.7	0.7	0.7	0.8	0.7	0.8	0.7	0.8	0.7375

rpm	rad/s omega	(N cm) M	(N m) M	Log Om	Log M
1	0.1047	0.01429	0.0001	-0.9801	-3.845
2	0.2094	0.02286	0.0002	-0.679	-3.641
4	0.4188	0.03893	0.0004	-0.378	-3.41
8	0.8376	0.07036	0.0007	-0.077	-3.153
16	1.6752	0.13198	0.0013	0.22407	-2.879
32	3.3504	0.25431	0.0025	0.5251	-2.595
64	6.7008	0.49684	0.005	0.82613	-2.304
128	13.402	0.97403	0.0097	1.12716	-2.011
64	6.7008	0.49684	0.005	0.82613	-2.304
32	3.3504	0.25235	0.0025	0.5251	-2.598
16	1.6752	0.12769	0.0013	0.22407	-2.894
8	0.8376	0.06572	0.0007	-0.077	-3.182
4	0.4188	0.03429	0.0003	-0.378	-3.465
2	0.2094	0.01857	0.0002	-0.679	-3.731
1	0.1047	0.01054	0.0001	-0.9801	-3.977

Determination of average shear rate
average shear rate = 4.47 angular velocity   b = 0.02692 m
viscosity = K shear rate^(n-1)   d = 0.04143 m
k'=4.47
K = consistency coefficient
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

rpm	angular velocit rad/s	KG^(n-1) average viscosi Pa.s	average shear rate	average shear stress	Lnshear stress	Lnshear rate	Sigma/ Gamma average viscosi Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	0.3775	0.46801	1.9684	0.67724	-0.759	4.206	1.25742	0.22906
2	0.2094	0.3534	0.93602	3.1495	1.14724	-0.066	3.365	2.01187	0.69907
4	0.4188	0.3309	1.87204	5.364	1.67971	0.627	2.865	3.42647	1.23153
8	0.8376	0.3098	3.74407	9.6945	2.27156	1.3202	2.589	6.1928	1.82339
16	1.6752	0.29	7.48814	18.183	2.90051	2.0133	2.428	11.6154	2.45233
32	3.3504	0.2715	14.9763	35.038	3.55644	2.7065	2.34	22.3821	3.10826
64	6.7008	0.2542	29.9526	68.452	4.22614	3.3996	2.285	43.7268	3.77796
128	13.402	0.238	59.9052	134.2	4.89932	4.0928	2.24	85.7247	4.45114
256	26.803	0.2228	119.81	68.452	4.22614	4.7859	0.571	43.7268	3.77796
					x				y

Regression Statistics

R Square	0.94793
Observations	9

		Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K =2.3482	Interce	0.85365	0.1826	4.67438	0.0016	0.422	1.28549
	x1	0.76534	0.0678	11.2891	3E-06	0.605	0.92565

9.- Mixer Viscometry, 15%, 15.1%, 61.17 g corn syrup, 9.23 g CaCO3

rpm	readings								Average
1	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
2	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
4	2.5	2.6	2.5	2.5	2.6	2.6	2.5	2.5	2.5375
8	4.8	4.9	4.9	4.8	4.8	4.8	4.9	4.8	4.8375
16	9.4	9.3	9.4	9.4	9.5	9.4	9.5	9.4	9.4125
32	18.5	18.7	18.6	18.6	18.6	18.6	18.7	18.6	18.6125
64	36.8	36.8	37	36.9	36.9	36.8	37.1	37.1	36.925
128	76	76	76.1	76	76.1	76.1	76	76.1	76.05
64	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2
32	20	20	20	20	20	20	20	20	20
16	10.2	10.3	10.2	10.3	10.2	10.3	10.2	10.2	10.2375
8	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
4	2.9	2.9	2.9	2.8	2.8	2.9	2.8	2.8	2.85
2	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
1	0.9	1	1	1	0.9	1	0.9	1	0.9625

rpm	rad/s omega	(N cm) M	(N m) M	Log Om	Log M
1	0.1047	0.01143	0.0001	-0.9801	-3.942
2	0.2094	0.02	0.0002	-0.679	-3.699
4	0.4188	0.03625	0.0004	-0.378	-3.441
8	0.8376	0.06911	0.0007	-0.077	-3.16
16	1.6752	0.13448	0.0013	0.22407	-2.871
32	3.3504	0.26592	0.0027	0.5251	-2.575
64	6.7008	0.52755	0.0053	0.82613	-2.278
128	13.402	1.08654	0.0109	1.12716	-1.964
64	6.7008	0.56006	0.0056	0.82613	-2.252
32	3.3504	0.28574	0.0029	0.5251	-2.544
16	1.6752	0.14626	0.0015	0.22407	-2.835
8	0.8376	0.07572	0.0008	-0.077	-3.121
4	0.4188	0.04072	0.0004	-0.378	-3.39
2	0.2094	0.02286	0.0002	-0.679	-3.641
1	0.1047	0.01375	0.0001	-0.9801	-3.862

Determination of average shear rate
average shear rate = 4.47 angular velocity
viscosity = K shear rate^(n-1)   b = 0.02692 m
k'=4.47   d = 0.04143 m
K = consistency coeffiicient
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

rpm	angular velocit rad/s	KG^(n-1) average viscosi Pa.s	average shear rate	average shear stress	Lnshear rate	Sigma/ Gamma average viscosi Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	2.33525	0.468	1.57475	-0.759	3.365	1.00594	0.00592
2	0.2094	2.21219	0.936	2.75581	-0.066	2.944	1.76039	0.56554
4	0.4188	2.09562	1.872	4.99491	0.627	2.668	3.19071	1.16024
8	0.8376	1.98519	3.7441	9.52231	1.3202	2.543	6.08278	1.80546
16	1.6752	1.88058	7.4881	18.5279	2.0133	2.474	11.8355	2.4711
32	3.3504	1.78148	14.976	36.6375	2.7065	2.446	23.4038	3.1529
64	6.7008	1.68761	29.953	72.6845	3.3996	2.427	46.4303	3.83795
128	13.402	1.59868	59.905	149.7	4.0928	2.499	95.6269	4.56045
256	26.803	1.51443	119.81	77.1627	4.7859	0.644	49.2909	3.89774
					x			y

Regression Statistics

R Square	0.95233
Observations	9

		Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K =2.0665	Interce	0.72586	0.1876	3.86882	0.0047	0.282	1.16951
	x1	0.82366	0.0696	11.8259	2E-06	0.659	0.98835

10.- Mixer Viscometry, 25%, 25%, 65.91 g corn syrup, 16.47 g CaCO3

rpm	readings								Average
1	1.5	1.4	1.4	1.5	1.5	1.5	1.4	1.5	1.4625
2	2.9	2.8	2.8	2.9	2.8	2.9	2.8	2.8	2.8375
4	5.5	5.4	5.5	5.5	5.4	5.4	5.4	5.5	5.45
8	10.5	10.5	10.5	10.6	10.5	10.5	10.5	10.5	10.5125
16	20.7	20.7	20.7	20.6	20.7	20.6	20.7	20.7	20.675
32	40	39.9	40	40	40	40	39.9	40	39.975
64	76.2	76.1	76	75.9	76	76	75.9	75.9	76
32	39.7	39.7	39.7	39.7	39.7	39.7	39.6	39.7	39.6875
16	20.7	20.6	20.7	20.6	20.7	20.7	20.6	20.7	20.6625
8	10.8	10.9	10.9	10.8	10.9	10.9	10.8	10.9	10.8625
4	5.8	5.8	5.8	5.8	5.8	5.8	5.9	5.8	5.8125
2	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.2	3.1625
1	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8

rpm	rad/s omega	(N cm) M	(N m) M	Log Om	Log M
1	0.1047	0.02089	0.0002	-0.9801	-3.68
2	0.2094	0.04054	0.0004	-0.679	-3.392
4	0.4188	0.07787	0.0008	-0.378	-3.109
8	0.8376	0.15019	0.0015	-0.077	-2.823
16	1.6752	0.29539	0.003	0.22407	-2.53
32	3.3504	0.57113	0.0057	0.5251	-2.243
64	6.7008	1.08582	0.0109	0.82613	-1.964
32	3.3504	0.56702	0.0057	0.5251	-2.246
16	1.6752	0.29521	0.003	0.22407	-2.53
8	0.8376	0.15519	0.0016	-0.077	-2.809
4	0.4188	0.08304	0.0008	-0.378	-3.081
2	0.2094	0.04518	0.0005	-0.679	-3.345
1	0.1047	0.02572	0.0003	-0.9801	-3.59

Determination of average shear rate
average shear rate = 4.47 angular velocity
viscosity = K shear rate^(n-1)
k'=4.47
K = consistency coeffiicient
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

b = 0.02692 m
d = 0.04143 m

rpm	angular velocit rad/s	KG^(n-1) average viscosi Pa.s	average shear rate	average shear stress	Lnshear stress	Lnshear rate	Sigma/ Gamma averae viscosi Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	4.6545	0.46801	2.8788	1.05739	-0.759	6.151	1.83898	0.60921
2	0.2094	4.4252	0.93602	5.5854	1.72016	-0.066	5.967	3.56793	1.27199
4	0.4188	4.2071	1.87204	10.728	2.37286	0.627	5.731	6.85295	1.92468
8	0.8376	3.9998	3.74407	20.693	3.0298	1.3202	5.527	13.2186	2.58163
16	1.6752	3.8027	7.48814	40.697	3.70616	2.0133	5.435	25.9972	3.25799
32	3.3504	3.6154	14.9763	78.688	4.36549	2.7065	5.254	50.2654	3.91732
64	6.7008	3.4372	29.9526	149.6	5.00797	3.3996	4.995	95.5641	4.5598
					x				y

Regression Statistics

R Square	0.99997
Observations	7

		Coeffici	Standar	t Statit	P-value	Lower 95%	Upper 95%
K =3.7893	Interce	1.33219	0.0041	321.076	6E-14	1.322	1.34286
	x1	0.95196	0.0022	439.214	9E-15	0.946	0.95753

DUPLICATE AT THIS CONDITIONS TO CHECK SAMPLE RECOVERY, THIS WAS DONE AT 25 % WEIGHT, AFTER 15 MINUTES

10:53	am					11:3 am		12 min	
rpm		readings							Average
1	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.1	3.1875
4	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8
8	10.9	10.8	10.9	10.8	10.9	10.8	10.8	10.8	10.8375
16	20.7	20.6	20.7	20.6	20.6	20.7	20.6	20.6	20.6375
32	39.9	40	40	40	40	40	49.9	40.1	41.2375
64	76.5	76.5	76.4	76.3	76.3	76.2	76.3	76.2	76.3375
32	39.5	39.6	39.6	39.5	39.6	39.5	39.6	39.6	39.5625
16	20.5	20.6	20.5	20.6	20.6	20.6	20.6	20.5	20.5625
8	10.7	10.8	10.8	10.8	10.7	10.8	10.7	10.8	10.7625
4	5.7	5.7	5.8	5.7	5.8	5.7	5.8	5.7	5.7375
2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
1	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7

rpm	rad/s omega	(N cm) M	(N m) M	Log Om	Log M
1	0.1047	0.02572	0.0003	-0.9801	-3.59
2	0.2094	0.04554	0.0005	-0.679	-3.342
4	0.4188	0.08287	0.0008	-0.378	-3.082
8	0.8376	0.15484	0.0015	-0.077	-2.81
16	1.6752	0.29485	0.0029	0.22407	-2.53
32	3.3504	0.58917	0.0059	0.5251	-2.23
64	6.7008	1.09065	0.0109	0.82613	-1.962
32	3.3504	0.56524	0.0057	0.5251	-2.248
16	1.6752	0.29378	0.0029	0.22407	-2.532
8	0.8376	0.15377	0.0015	-0.077	-2.813
4	0.4188	0.08197	0.0008	-0.378	-3.086
2	0.2094	0.04429	0.0004	-0.679	-3.354
1	0.1047	0.02429	0.0002	-0.9801	-3.615

Determination of average shear rate
average shear rate = 4.47 angular velocity   b = 0.02692 m
viscosity = K shear rate^(n-1)   d = 0.04143 m
k'=4.47
K = consistency coeffiicient
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

rpm	angular velocit rad/s	KG^(n-1) average viscosi Pa.s	average shear rate	average shear stress	Lnshear stress	Lnshear rate	Sigma/ Gamma average viscosi Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	4.9393	0.46801	3.5432	1.26503	-0.759	7.571	2.26336	0.81685
2	0.2094	4.6403	0.93602	6.2744	1.83648	-0.066	6.703	4.00803	1.3883
4	0.4188	4.3593	1.87204	11.417	2.4351	0.627	6.099	7.29305	1.98692
8	0.8376	4.0954	3.74407	21.333	3.06025	1.3202	5.698	13.6273	2.61208
16	1.6752	3.8475	7.48814	40.624	3.70435	2.0133	5.425	25.95	3.25617
32	3.3504	3.6145	14.9763	81.173	4.39659	2.7065	5.42	51.8529	3.94841
64	6.7008	3.3957	29.9526	150.27	5.0124	3.3996	5.017	95.9884	4.56423
					x				y

Regression Statistics

R Square	0.99925
Observations	7

			Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K =	4.28	Interce	1.45395	0.0213	68.292	7E-10	1.399	1.50868
		x1	0.90847	0.0111	81.6859	2E-10	0.88	0.93705

AFTER 35 MINUTES CHECK THESE TWO LINE

rpm		readings							Average
1	1.8	1.8	1.8	1.8	1.8	1.7	1.8	1.8	1.7875
2	3.2	3.2	3.2	3.1	3.2	3.2	3.1	3.1	3.1625
4	5.8	5.8	5.8	5.8	5.7	5.7	5.8	5.8	5.775
8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8
16	20.6	20.7	20.7	20.6	20.7	20.7	20.7	20.7	20.675
32	39.9	40	39.9	40	40	40.1	40.1	40	40
64	76	75.9	75.9	76	75.9	75.9	76	75.9	75.9375
32	39.7	39.6	39.6	39.6	39.5	39.6	39.6	39.6	39.6
16	20.5	20.6	20.5	20.5	20.6	20.6	20.5	20.6	20.55
8	10.8	10.7	10.7	10.8	10.7	10.8	10.8	10.7	10.75
4	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
1	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.02554	0.0003	-0.9801	-3.593
2	0.2094	0.04518	0.0005	-0.679	-3.345
4	0.4188	0.08251	0.0008	-0.378	-3.084
8	0.8376	0.1543	0.0015	-0.077	-2.812
16	1.6752	0.29539	0.003	0.22407	-2.53
32	3.3504	0.57149	0.0057	0.5251	-2.243
64	6.7008	1.08493	0.0108	0.82613	-1.965
32	3.3504	0.56577	0.0057	0.5251	-2.247
16	1.6752	0.2936	0.0029	0.22407	-2.532
8	0.8376	0.15359	0.0015	-0.077	-2.814
4	0.4188	0.08144	0.0008	-0.378	-3.089
2	0.2094	0.04429	0.0004	-0.679	-3.354
1	0.1047	0.02429	0.0002	-0.9801	-3.615

Determination of average shear rate
average shear rate = 4.47 angular velocity b = 0.02692 m
viscosity = K shear rate^(n-1) d = 0.04143 m
k'=4.47
K = consistency coeffiicient
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

rpm	angular velocit rad/s	KG^(n-1) average viscos. Pa.s	average shear rate	average shear stress	Lnshear stress	Lnshear rate	Sigma/ Gamma average viscosi Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	4.9271	0.46801	3.5186	1.25806	-0.759	7.518	2.24764	0.80988
2	0.2094	4.6247	0.93602	6.2252	1.8286	-0.066	6.651	3.9766	1.38043
4	0.4188	4.3408	1.87204	11.368	2.43078	0.627	6.072	7.26161	1.9826
8	0.8376	4.0743	3.74407	21.259	3.05679	1.3202	5.678	13.5802	2.60861
16	1.6752	3.8242	7.48814	40.697	3.70616	2.0133	5.435	25.9972	3.25799
32	3.3504	3.5894	14.9763	78.737	4.36612	2.7065	5.257	50.2969	3.91794
64	6.7008	3.3691	29.9526	149.48	5.00715	3.3996	4.99	95.4855	4.55897
					x				y

Regression Statistics

R Square	0.99942
Observations	7

		Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K =4.2554	Interce	1.44818	0.0186	77.7103	3E-10	1.4	1.49608
	x1	0.90672	0.0097	93.1423	1E-10	0.882	0.93174

11.- Mixer Viscometry, 25%, 25%, 74.08 g corn syrup, 18.54 g CaCO3

rpm	readings								Average
1	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
2	3.3	3.3	3.3	3.2	3.2	3.2	3.2	3.3	3.25
4	5.8	5.8	5.9	5.9	5.8	5.8	5.8	5.8	5.825
8	10.7	10.7	10.8	10.7	10.7	10.8	10.6	10.7	10.7125
16	20.2	20.3	20.2	20.4	20.3	20.3	20.3	20.3	20.2875
32	38.7	38.7	38.8	38.9	38.8	38.8	38.8	38.8	38.7875
64	73.7	73.7	73.6	73.5	73.4	73.3	73.3	73.2	73.4625
32	38.3	38.2	38.2	38.1	38.2	38.2	38.1	38.1	38.175
16	19.9	20	19.8	19.9	19.9	19.9	19.9	19.9	19.9
8	10.6	10.5	10.6	10.6	10.5	10.6	10.6	10.5	10.5625
4	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
1	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.02715	0.0003	-0.9801	-3.566
2	0.2094	0.04643	0.0005	-0.679	-3.333
4	0.4188	0.08322	0.0008	-0.378	-3.08
8	0.8376	0.15305	0.0015	-0.077	-2.815
16	1.6752	0.28985	0.0029	0.22407	-2.538
32	3.3504	0.55416	0.0055	0.5251	-2.256
64	6.7008	1.04957	0.0105	0.82613	-1.979
32	3.3504	0.54541	0.0055	0.5251	-2.263
16	1.6752	0.28431	0.0028	0.22407	-2.546
8	0.8376	0.15091	0.0015	-0.077	-2.821
4	0.4188	0.08144	0.0008	-0.378	-3.089
2	0.2094	0.04572	0.0005	-0.679	-3.34
1	0.1047	0.02715	0.0003	-0.9801	-3.566

Determination of average shear rate
average shear rate = 4.47 angular velocity b = 0.02692 m
viscosity = K shear rate^(n-1) d = 0.04143 m
k'=4.47
K = consistency coeffiicient
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

rpm	angular velocit rad/s	KG^(n-1) average viscosi Pa.s	average shear rate	average shear stress	Lnshear stress	Lnshear rate	Sigma/ Gamma average viscosi Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	5.229	0.46801	3.74	1.31909	-0.7593	7.9914	2.389	0.87092
2	0.2094	4.8122	0.93602	6.3974	1.85589	-0.0661	6.8347	4.087	1.40772
4	0.4188	4.4286	1.87204	11.466	2.4394	0.62703	6.125	7.324	1.99122
8	0.8376	4.0756	3.74407	21.087	3.04865	1.32017	5.6321	13.47	2.60047
16	1.6752	3.7507	7.48814	39.935	3.68724	2.01332	5.3331	25.51	3.23907
32	3.3504	3.4518	14.9763	76.351	4.33534	2.70647	5.0981	48.77	3.88716
64	6.7008	3.1766	29.9526	144.61	4.97401	3.39962	4.8278	92.37	4.52584
						x			y

Regression Statistics

R Square	0.99902
Observations	7

		Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K =4.3843	Interce	1.47802	0.0237	62.2507	1E-09	1.417	1.53906
	x1	0.88476	0.0124	71.3354	5E-10	0.853	0.91664

12.- Mixer Viscometry, 25%, 25 %, 65.09 g corn syrup, 16.27 g CaCO3

rpm		readings							Average
1	1.9	1.9	1.9	1.8	1.8	1.9	1.9	1.9	1.875
2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
4	5.5	5.4	5.5	5.5	5.5	5.4	5.4	5.4	5.45
8	9.9	9.9	9.9	9.8	9.9	9.8	9.8	9.8	9.85
16	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5
32	35.4	35.4	35.3	35.4	35.4	35.4	35.3	35.3	35.3625
64	67.5	67.4	67.4	67.3	67.3	67.2	67.2	67.1	67.3
32	34.8	34.8	34.8	34.8	34.8	34.8	34.7	34.8	34.7875
16	18.1	18.1	18.1	18.1	18.2	18.1	18.1	18.1	18.1125
8	9.6	9.6	9.6	9.6	9.5	9.7	9.6	9.6	9.6
4	5.2	5.2	5.2	5.3	5.2	5.2	5.2	5.2	5.2125
2	2.9	3	2.9	2.9	2.9	2.9	2.9	2.9	2.9125
1	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.02679	0.0003	-0.9801	-3.572
2	0.2094	0.04429	0.0004	-0.679	-3.354
4	0.4188	0.07787	0.0008	-0.378	-3.109
8	0.8376	0.14073	0.0014	-0.077	-2.852
16	1.6752	0.26431	0.0026	0.22407	-2.578
32	3.3504	0.50523	0.0051	0.5251	-2.297
64	6.7008	0.96153	0.0096	0.82613	-2.017
32	3.3504	0.49701	0.005	0.5251	-2.304
16	1.6752	0.25878	0.0026	0.22407	-2.587
8	0.8376	0.13716	0.0014	-0.077	-2.863
4	0.4188	0.07447	0.0007	-0.378	-3.128
2	0.2094	0.04161	0.0004	-0.679	-3.381
1	0.1047	0.02429	0.0002	-0.9801	-3.615

Determination of average shear rate
average shear rate = 4.47 angular velocity
viscosity = K shear rate^(n-1) b = 0.02692 m
k'=4.47 d = 0.04143 m
K = consistency coeffiicient
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

		KG^(n-1)					Sigma/ Gamma	1/3	Ln 1/3
	angular velocit	average viscosi	average shear	average shear	Lnshear	Lnshear	average viscosi	average shear	average shear
rpm	rad/s	Pa.s	rate	stress	stress	rate	Pa.s	stress	stress
1	0.1047	4.8927	0.46801	3.6908	1.30585	-0.759	7.886	2.35767	0.85767
2	0.2094	4.4782	0.93602	6.1022	1.80864	-0.066	6.519	3.89801	1.36047
4	0.4188	4.0988	1.87204	10.728	2.37286	0.627	5.731	6.85295	1.92468
8	0.8376	3.7516	3.74407	19.389	2.96471	1.3202	5.179	12.3856	2.51653
16	1.6752	3.4337	7.48814	36.416	3.59501	2.0133	4.863	23.2623	3.14683
32	3.3504	3.1428	14.9763	69.609	4.24289	2.7065	4.648	44.4656	3.79472
64	6.7008	2.8766	29.9526	132.48	4.8864	3.3996	4.423	84.6245	4.43822
					x				y

Regression Statistics
R Square 0.99821
Observations 7

		Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K =4.1873	Interce	1.43206	0.0314	45.5906	7E-09	1.351	1.5128
	x1	0.86728	0.0164	52.8559	3E-09	0.825	0.90946

13.- Mixer Viscometry, 35%, 35%, 76.16 g corn syrup, 26.67 g CaCO3

rpm	readings								Average
1	3.9	4	4	4	4.1	4	4	4.1	4.0125
2	7	7	7.1	7	7	7	7.1	7.1	7.0375
4	12.4	12.4	12.3	12.4	12.5	12.3	12.5	12.5	12.4125
8	22.5	22.3	22.3	22.4	22.3	22.5	22.4	22.4	22.3875
16	41.1	41.3	41.1	41	41	41	41.1	41.2	41.1
32	75.8	75.8	75.7	75.8	75.7	75.6	75.5	75.7	75.7
16	41.4	41.6	41.6	41.6	41.6	41.4	41.4	41.6	41.525
8	23.1	23.3	23	23.3	23.1	23.1	23.1	23	23.125
4	13.2	13.1	13.3	13.3	13.2	13.1	13.1	13.3	13.2
2	7.8	7.7	7.8	7.8	7.7	7.8	7.7	7.7	7.75
1	4.8	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7125

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.05733	0.0006	-0.9801	-3.242
2	0.2094	0.10055	0.001	-0.679	-2.998
4	0.4188	0.17734	0.0018	-0.378	-2.751
8	0.8376	0.31985	0.0032	-0.077	-2.495
16	1.6752	0.5872	0.0059	0.22407	-2.231
32	3.3504	1.08154	0.0108	0.5251	-1.966
16	1.6752	0.59327	0.0059	0.22407	-2.227
8	0.8376	0.33039	0.0033	-0.077	-2.481
4	0.4188	0.18859	0.0019	-0.378	-2.724
2	0.2094	0.11073	0.0011	-0.679	-2.956
1	0.1047	0.06733	0.0007	-0.9801	-3.172

Determination of average shear rate
average shear rate = 4.47 angular velocity
viscosity = K shear rate^(n-1)
k'=4.47
K = consistency coeffiicient
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

b = 0.02692 m
d = 0.04143 m

rpm	angular velocit rad/s	KG^(n-1) average viscosi Pa.s	average shear rate	average shear stress	Lnshear stress	Lnshear rate	Sigma/ Gamma average viscosi Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	12.389	0.46801	7.8984	2.06665	-0.759	16.88	5.0454	1.61848
2	0.2094	10.944	0.93602	13.853	2.62849	-0.066	14.8	8.84911	2.18032
4	0.4188	9.6672	1.87204	24.433	3.19594	0.627	13.05	15.6077	2.74777
8	0.8376	8.5395	3.74407	44.068	3.78574	1.3202	11.77	28.1505	3.33757
16	1.6752	7.5434	7.48814	80.903	4.39325	2.0133	10.8	51.68	3.94507
32	3.3504	6.6635	14.9763	149.01	5.00402	2.7065	9.95	95.1868	4.55584

Regression Statistics

R Square	0.99967
Observations	6

		Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K =9.3805	Interce	2.23863	0.0118	189.857	8E-11	2.206	2.27137
	x1	0.84793	0.0077	110.221	1E-09	0.827	0.86929

14.- Mixer Viscometry, 35%, 35%, 71.35 g corn syrup, 24.98 g CaCO3

rpm	readings								Average
1	4.8	5	4.9	4.9	5	4.9	4.9	5	4.925
2	8.4	8.3	8.4	8.3	8.3	8.4	8.4	8.5	8.375
4	14.5	14.7	14.5	14.6	14.5	14.5	14.7	14.5	14.5625
8	25.5	25.8	26	25.6	25.9	26.2	25.9	26.1	25.875
16	46.9	47.2	47	48.9	46.7	47.4	46.8	47.2	47.2625
32	85.5	85.4	85.2	85.4	85.5	85.3	85.4	85.5	85.4
16	47.4	47.4	47.5	47.5	47.3	47.5	47.6	47.4	47.45
8	26.5	26.6	26.6	26.7	26.6	26.6	26.7	26.7	26.625
4	15.5	15.4	15.3	15.2	15.4	15.4	15.3	15.2	15.3375
2	9.1	9	9	9.1	9.1	9.1	9.1	9.1	9.075
1	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.5	5.5875

rpm	rad/s omega	(N cm) M	(N m) M	Log Om	Log M
1	0.1047	0.07036	0.0007	-0.9801	-3.153
2	0.2094	0.11966	0.0012	-0.679	-2.922
4	0.4188	0.20806	0.0021	-0.378	-2.682
8	0.8376	0.36968	0.0037	-0.077	-2.432
16	1.6752	0.67525	0.0068	0.22407	-2.171
32	3.3504	1.22012	0.0122	0.5251	-1.914
16	1.6752	0.67793	0.0068	0.22407	-2.169
8	0.8376	0.3804	0.0038	-0.077	-2.42
4	0.4188	0.21913	0.0022	-0.378	-2.659
2	0.2094	0.12966	0.0013	-0.679	-2.887
1	0.1047	0.07983	0.0008	-0.9801	-3.098

Determination of average shear rate
average shear rate = 4.47 angular velocity
viscosity = K shear rate^(n-1) b = 0.02692 m
k'=4.47 d = 0.04143 m
K = consistency coeffiicient
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

rpm	angular velocit rad/s	KG^(n-1) average viscosi Pa.s	average shear rate	average shear stress	Lnshear stress	Lnshear rate	Sigma/ Gamma average viscosi Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	14.87	0.46801	9.6945	2.27156	-0.7593	20.714	6.193	1.82339
2	0.2094	12.973	0.93602	16.486	2.80249	-0.0661	17.613	10.53	2.35431
4	0.4188	11.318	1.87204	28.665	3.35569	0.62017	15.312	18.31	2.90751
8	0.8376	9.874	3.74407	50.933	3.93052	1.32017	13.604	32.54	3.48234
16	1.6752	8.6142	7.48814	93.033	4.53296	2.01332	12.424	59.43	4.08478
						x			y

Regression Statistics

R Square	0.99939
Observations	5

		Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K =11.238	Interce	2.41929	0.0135	179.206	6E-09	2.376	2.46225
	x1	0.81524	0.0116	70.2701	2E-07	0.778	0.85216

15.- Mixer Viscometry, 35%, 35%, 71.31 g corn syrup, 24.95 g CaCO3

rpm		readings							Average
1	4.6	4.6	4.6	4.7	4.7	4.7	4.7	4.7	4.6625
2	8	8.1	8.1	8.1	8.1	8.2	8.1	8.1	8.1
4	14	14.1	14.1	14.1	14.1	14.2	14.1	14.1	14.1
8	24.8	25.1	25	25	25	25.2	24.9	25	25
16	45.3	45.2	45.5	45.2	45.4	45.3	45.3	45.4	45.325
32	82.4	82.3	82.3	82.3	82.4	82.2	82.3	82.3	82.3125
16	45.5	45.5	45.4	45.6	45.6	45.5	45.6	45.6	45.5375
8	25.5	25.5	25.5	25.5	25.6	25.6	25.5	25.6	25.5375
4	14.7	14.7	14.6	14.7	14.7	14.7	14.6	14.7	14.675
2	8.7	8.7	8.6	8.7	8.6	8.7	8.7	8.8	8.6875
1	5.3	5.3	5.3	5.3	5.3	5.3	5.4	5.4	5.325

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.06661	0.0007	-0.9801	-3.176
2	0.2094	0.11573	0.0012	-0.679	-2.937
4	0.4188	0.20145	0.002	-0.378	-2.696
8	0.8376	0.35718	0.0036	-0.077	-2.447
16	1.6752	0.64757	0.0065	0.22407	-2.189
32	3.3504	1.17601	0.0118	0.5251	-1.93
16	1.6752	0.6506	0.0065	0.22407	-2.187
8	0.8376	0.36486	0.0036	-0.077	-2.438
4	0.4188	0.20966	0.0021	-0.378	-2.678
2	0.2094	0.12412	0.0012	-0.679	-2.906
1	0.1047	0.07608	0.0008	-0.9801	-3.119

Determination of average shear rate
average shear rate = 4.47 angular velocity   b = 0.02692 m
viscosity = K shear rate^(n-1)   d = 0.04143 m
k'=4.47
K = consistency coefficient
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

rpm	angular velocit rad/s	KG^(n-1) average viscosi Pa.s	average shear rate	average shear stress	Lnshear stress	Lnshear rate	Sigma/ Gamma average viscosi Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	14.21	0.46801	9.1778	2.21679	-0.7593	19.61	5.863	1.76862
2	0.2094	12.42	0.93602	15.944	2.7691	-0.0661	17.034	10.19	2.32093
4	0.4188	10.856	1.87204	27.755	3.32341	0.62703	14.826	17.73	2.87524
8	0.8376	9.4894	3.74407	49.211	3.89612	1.32017	13.144	31.44	3.44794
16	1.6752	8.2945	7.48814	89.219	4.4911	2.01332	11.915	56.99	4.04292
32	3.3504	7.2501	14.9763	162.03	5.08776	2.70647	10.819	103.5	4.63959
						x			y

Regression Statistics

R Square	0.99969
Observations	6

		Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K =10.763	Interce	2.37615	0.0112	211.35	4E-11	2.345	2.40737
	x1	0.82825	0.0073	112.915	1E-09	0.808	0.84862

DUPLICATE AT THIS CONDITIONS TO CHECK SAMPLE RECOVERY, THIS WAS DONE AT 25% WEIGHT, AFTER 15 MINUTES

10:53 am						11:3		12 min	
rpm		readings							Average
1	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.1	3.1875
4	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8
8	10.9	10.8	10.9	10.8	10.9	10.8	10.8	10.8	10.8375
16	20.7	20.6	20.7	20.6	20.6	20.7	20.6	20.6	20.6375
32	39.9	40	40	40	40	40	49.9	40.1	41.2375
64	76.5	76.5	76.4	76.3	76.3	76.2	76.3	76.2	76.3375
32	39.5	39.6	39.6	39.5	39.6	39.5	39.6	39.6	39.5625
16	20.5	20.6	20.5	20.6	20.6	20.6	20.6	20.5	20.5625
8	10.7	10.8	10.8	10.8	10.7	10.8	10.7	10.8	10.7625
4	5.7	5.7	5.8	5.7	5.8	5.7	5.8	5.7	5.7375
2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
1	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7

rpm	rad/s omega	(N cm) M	(N m) M	Log Om	Log M
1	0.1047	0.02572	0.0003	-0.9801	-3.59
2	0.2094	0.04554	0.0005	-0.679	-3.342
4	0.4188	0.08287	0.0008	-0.378	-3.082
8	0.8376	0.15484	0.0015	-0.077	-2.81
16	1.6752	0.29485	0.0029	0.22407	-2.53
32	3.3504	0.58917	0.0059	0.5251	-2.23
64	6.7008	1.09065	0.0109	0.82613	-1.962
32	3.3504	0.56524	0.0057	0.5251	-2.248
16	1.6752	1.09065	0.0109	0.22407	-1.962
8	0.8376	0.56524	0.0057	-0.077	-2.248
4	0.4188	0.29378	0.0029	-0.378	-2.532
2	0.2094	0.15377	0.0015	-0.679	-2.813
1	0.1047	0.08197	0.0008	-0.9801	-3.086

Determination of average shear rate
average shear rate = 4.47 angular velocity
viscosity = K shear rate^(n-1)   b = 0.02692 m
k'=4.47   d = 0.04143 m
K = consistency coeffiicient
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

rpm	angular velocit rad/s	KG^(n-1) average viscosi Pa.s	average shear rate	average shear stress	Lnshear stress	Lnshear rate	Sigma/ Gamma average viscosi Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	10.624	0.46801	3.5432	1.26503	-0.7593	7.5708	2.263	0.81685
2	0.2094	9.0295	0.93602	6.2744	1.83648	-0.0661	6.7033	4.008	1.3883
4	0.4188	7.6743	1.87204	11.417	2.4351	0.62703	6.0987	7.293	1.98692
8	0.8376	6.5226	3.74407	21.333	3.06025	1.32017	5.6978	13.63	2.61208
16	1.6752	5.5437	7.48814	40.624	3.70435	2.01332	5.4251	25.95	3.25617
32	3.3504	4.7117	14.9763	81.173	4.39659	2.70647	5.4201	51.85	3.94841
						x			y

Regression Statistics

R Square	0.99892
Observations	6

		Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K =4.2907	Interce	1.45644	0.0228	63.937	2E-08	1.393	1.51969
	x1	0.90216	0.0149	60.7022	2E-08	0.861	0.94343

AFTER 35 MINUTES CHECK THESE TWO LINE

rpm	readings								Average
1	1.8	1.8	1.8	1.8	1.8	1.7	1.8	1.8	1.7875
2	3.2	3.2	3.2	3.1	3.2	3.2	3.1	3.1	3.1625
4	5.8	5.8	5.8	5.8	5.7	5.7	5.8	5.8	5.775
8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8
16	20.6	20.7	20.7	20.6	20.7	20.7	20.7	20.7	20.675
32	39.9	40	39.9	40	40	40.1	40.1	40	40
64	76	75.9	75.9	76	75.9	75.9	76	75.9	75.9375
32	39.7	39.6	39.6	39.6	39.5	39.6	39.6	39.6	39.6
16	20.5	20.6	20.5	20.5	20.6	20.6	20.5	20.6	20.55
8	10.8	10.7	10.7	10.8	10.7	10.8	10.8	10.7	10.75
4	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
1	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.02554	0.0003	-0.9801	-3.593
2	0.2094	0.04518	0.0005	-0.679	-3.345
4	0.4188	0.08251	0.0008	-0.378	-3.084
8	0.8376	0.1543	0.0015	-0.077	-2.812
16	1.6752	0.29539	0.003	0.22407	-2.53
32	3.3504	0.57149	0.0057	0.5251	-2.243
64	6.7008	1.08493	0.0108	0.82613	-1.965
32	3.3504	0.56577	0.0057	0.5251	-2.247
16	1.6752	1.08493	0.0108	0.22407	-1.965
8	0.8376	0.56577	0.0057	-0.077	-2.247
4	0.4188	0.2936	0.0029	-0.378	-2.532
2	0.2094	0.15359	0.0015	-0.679	-2.814
1	0.1047	0.08144	0.0008	-0.9801	-3.089

Determination of average shear rate
average shear rate = 4.47 angular velocity b = 0.02692 m
viscosity = K shear rate^(n-1) d = 0.04143 m
k'=4.47
K = consistency coeffiicient
average shear stress = 2 M / pi b d^2
(b/d + 1/3) 0.9831

rpm	angular velocit rad/s	KG^(n-1) average viscosi Pa.s	average shear rate	average shear stress	Lnshear stress	Lnshear rate	Sigma/ Gamma average viscosi Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	10.587	0.46801	3.5186	1.25806	-0.7593	7.5182	2.248	0.80988
2	0.2094	8.9926	0.93602	6.2252	1.8286	-0.0661	6.6507	3.977	1.38043
4	0.4188	7.6383	1.87204	11.368	2.43078	0.62703	6.0724	7.262	1.9826
8	0.8376	6.4879	3.74407	21.259	3.05679	1.32017	5.6781	13.58	2.60861
16	1.6752	5.5107	7.48814	40.697	3.70616	2.01332	5.4349	26	3.25799
32	3.3504	4.6808	14.9763	78.737	4.36612	2.70647	5.2575	50.3	3.91794
64	6.7008	3.9758	29.9526	149.48	5.00715	3.39962	4.9905	95.49	4.55897
						x			y

Regression Statistics

R Square	0.99942
Observations	7

		Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K =4.2554	Interce	1.44818	0.0186	77.7103	3E-10	1.4	1.49608
	x1	0.90672	0.0097	93.1423	1E-10	0.882	0.93174

IX. APPENDIX 3. CALCULATIONS AT 25°C TO FIT THE GLOBAL MODEL.

These calculations were done based on the results coming from the appendix 2, and it was used to fit a model using the values coming from the three different temperatures.

	ln	25-0-1						ln
sstress	sstress	K	lnK	T	1/T	C	srate	srate
0.50297	-0.6872	0.9244	-0.0786	298.15	0.00335	0	0.46801	-0.7593
0.86448	-0.1456	0.9244	-0.0786	298.15	0.00335	0	0.93602	-0.0661
1.57178	0.45221	0.9244	-0.0786	298.15	0.00335	0	1.87204	0.62703
3.0964	1.13024	0.9244	-0.0786	298.15	0.00335	0	3.74407	1.32017
6.01991	1.79507	0.9244	-0.0786	298.15	0.00335	0	7.48814	2.01332
12.0241	2.48691	0.9244	-0.0786	298.15	0.00335	0	14.9763	2.70647
23.9382	3.17547	0.9244	-0.0786	298.15	0.00335	0	29.9526	3.39962
47.6091	3.86302	0.9244	-0.0786	298.15	0.00335	0	59.9052	4.09276
94.2123	4.54555	0.9244	-0.0786	298.15	0.00335	0	119.81	4.78591

	ln	25-0-2						ln
sstress	sstress	K	lnK	T	1/T	C	srate	srate
0.37723	-0.9749	1.2729	0.2413	298.15	0.00335	0	0.46801	-0.7593
0.7073	-0.3463	1.2729	0.2413	298.15	0.00335	0	0.93602	-0.0661
1.46175	0.37964	1.2729	0.2413	298.15	0.00335	0	1.87204	0.62703
2.93922	1.07815	1.2729	0.2413	298.15	0.00335	0	3.74407	1.32017
5.97275	1.78721	1.2729	0.2413	298.15	0.00335	0	7.48814	2.01332
12.0555	2.48952	1.2729	0.2413	298.15	0.00335	0	14.9763	2.70647
24.001	3.1781	1.2729	0.2413	298.15	0.00335	0	29.9526	3.39962
47.672	3.86434	1.2729	0.2413	298.15	0.00335	0	59.9052	4.09276
94.228	4.54572	1.2729	0.2413	298.15	0.00335	0	119.81	4.78591

	ln	25-0-3						ln
sstress	sstress	K	lnK	T	1/T	C	srate	srate
0.25148	-1.3804	0.65471	-0.4236	298.15	0.00335	0	0.46801	-0.7593
0.62871	-0.4641	0.65471	-0.4236	298.15	0.00335	0	0.93602	-0.0661
1.33601	0.28969	0.65471	-0.4236	298.15	0.00335	0	1.87204	0.62703
2.8292	1.03999	0.65471	-0.4236	298.15	0.00335	0	3.74407	1.32017
5.89416	1.77396	0.65471	-0.4236	298.15	0.00335	0	7.48814	2.01332
11.9298	2.47904	0.65471	-0.4236	298.15	0.00335	0	14.9763	2.70647
23.9382	3.17547	0.65471	-0.4236	298.15	0.00335	0	29.9526	3.39962
47.8135	3.86731	0.65471	-0.4236	298.15	0.00335	0	59.9052	4.09276
95.2497	4.5565	0.65471	-0.4236	298.15	0.00335	0	119.81	4.78591

	ln	25-5-1						ln
sstress	sstress	K	lnK	T	1/T	C	srate	srate
0.5344	-0.6266	1.1114	0.10562	298.15	0.00335	5	0.46801	-0.7593
1.00594	0.00592	1.1114	0.10562	298.15	0.00335	5	0.93602	-0.0661
2.02759	0.70685	1.1114	0.10562	298.15	0.00335	5	1.87204	0.62703
3.96088	1.37647	1.1114	0.10562	298.15	0.00335	5	3.74407	1.32017
7.70171	2.04144	1.1114	0.10562	298.15	0.00335	5	7.48814	2.01332
15.2777	2.72639	1.1114	0.10562	298.15	0.00335	5	14.9763	2.70647
30.241	3.4092	1.1114	0.10562	298.15	0.00335	5	29.9526	3.39962
59.3503	4.08346	1.1114	0.10562	298.15	0.00335	5	59.9052	4.09276
98.3147	4.58817	1.1114	0.10562	298.15	0.00335	5	119.81	4.78591

	ln	25-5-2						ln
sstress	sstress	K	lnK	T	1/T	C	srate	srate
0.50297	-0.6872	1.10153	0.0967	298.15	0.00335	5	0.46801	-0.7593
1.02166	0.02142	1.10153	0.0967	298.15	0.00335	5	0.93602	-0.0661
2.04331	0.71457	1.10153	0.0967	298.15	0.00335	5	1.87204	0.62703
3.9766	1.38043	1.10153	0.0967	298.15	0.00335	5	3.74407	1.32017
7.92176	2.06961	1.10153	0.0967	298.15	0.00335	5	7.48814	2.01332
15.6549	2.75078	1.10153	0.0967	298.15	0.00335	5	14.9763	2.70647
31.0426	3.43536	1.10153	0.0967	298.15	0.00335	5	29.9526	3.39962
59.4289	4.08478	1.10153	0.0967	298.15	0.00335	5	59.9052	4.09276
100.295	4.60812	1.10153	0.0967	298.15	0.00335	5	119.81	4.78591

	ln	25-5-3						ln
sstress	sstress	K	lnK	T	1/T	C	srate	srate
0.1729	-1.7551	0.6461	-0.4368	298.15	0.00335	5	0.46801	-0.7593
0.66015	-0.4153	0.6461	-0.4368	298.15	0.00335	5	0.93602	-0.0661
1.5875	0.46216	0.6461	-0.4368	298.15	0.00335	5	1.87204	0.62703
3.5365	1.26314	0.6461	-0.4368	298.15	0.00335	5	3.74407	1.32017
7.46594	2.01035	0.6461	-0.4368	298.15	0.00335	5	7.48814	2.01332
15.1677	2.71916	0.6461	-0.4368	298.15	0.00335	5	14.9763	2.70647
30.6339	3.42211	0.6461	-0.4368	298.15	0.00335	5	29.9526	3.39962
61.2207	4.11449	0.6461	-0.4368	298.15	0.00335	5	59.9052	4.09276
120.54	4.79198	0.6461	-0.4368	298.15	0.00335	5	119.81	4.78591

sstress	ln sstress	25-15-1 K	lnK	T	1/T	C	srate	ln srate
1.13168	0.1237	2.31452	0.8392	298.15	0.00335	15	0.46801	-0.7593
1.96472	0.67535	2.31452	0.8392	298.15	0.00335	15	0.93602	-0.0661
3.55222	1.26757	2.31452	0.8392	298.15	0.00335	15	1.87204	0.62703
6.61718	1.88967	2.31452	0.8392	298.15	0.00335	15	3.74407	1.32017
12.8257	2.55145	2.31452	0.8392	298.15	0.00335	15	7.48814	2.01332
25.337	3.23227	2.31452	0.8392	298.15	0.00335	15	14.9763	2.70647
49.7939	3.90789	2.31452	0.8392	298.15	0.00335	15	29.9526	3.39962
96.8843	4.57352	2.31452	0.8392	298.15	0.00335	15	59.9052	4.09276
49.8411	3.90884	2.31452	0.8392	298.15	0.00335	15	119.81	4.78591

sstress	ln sstress	25-15-2 K	lnK	T	1/T	C	srate	ln srate
1.25742	0.22906	2.3482	0.85365	298.15	0.00335	15	0.46801	-0.7593
2.01187	0.69907	2.3482	0.85365	298.15	0.00335	15	0.93602	-0.0661
3.42647	1.23153	2.3482	0.85365	298.15	0.00335	15	1.87204	0.62703
6.1928	1.82339	2.3482	0.85365	298.15	0.00335	15	3.74407	1.32017
11.6154	2.45233	2.3482	0.85365	298.15	0.00335	15	7.48814	2.01332
22.3821	3.10826	2.3482	0.85365	298.15	0.00335	15	14.9763	2.70647
43.7268	3.77796	2.3482	0.85365	298.15	0.00335	15	29.9526	3.39962
85.7247	4.45114	2.3482	0.85365	298.15	0.00335	15	59.9052	4.09276
43.7268	3.77796	2.3482	0.85365	298.15	0.00335	15	119.81	4.78591

sstress	ln sstress	25-15-3 K	lnK	T	1/T	C	srate	ln srate
2.35767	0.85767	2.06651	0.72586	298.15	0.00335	15	0.46801	-0.7593
3.89801	1.36047	2.06651	0.72586	298.15	0.00335	15	0.93602	-0.0661
6.85295	1.92468	2.06651	0.72586	298.15	0.00335	15	1.87204	0.62703
12.3856	2.51653	2.06651	0.72586	298.15	0.00335	15	3.74407	1.32017
23.2623	3.14683	2.06651	0.72586	298.15	0.00335	15	7.48814	2.01332
44.4656	3.79472	2.06651	0.72586	298.15	0.00335	15	14.9763	2.70647
84.6245	4.43822	2.06651	0.72586	298.15	0.00335	15	29.9526	3.39962

sstress	ln sstress	25-25-1 K	lnK	T	1/T	C	srate	ln srate
1.83898	0.60921	3.78933	1.33219	298.15	0.00335	25	0.46801	-0.7593
3.56793	1.27199	3.78933	1.33219	298.15	0.00335	25	0.93602	-0.0661
6.85295	1.92468	3.78933	1.33219	298.15	0.00335	25	1.87204	0.62703
13.2186	2.58163	3.78933	1.33219	298.15	0.00335	25	3.74407	1.32017
25.9972	3.25799	3.78933	1.33219	298.15	0.00335	25	7.48814	2.01332
50.2654	3.91732	3.78933	1.33219	298.15	0.00335	25	14.9763	2.70647
95.5641	4.5598	3.78933	1.33219	298.15	0.00335	25	29.9526	3.39962

sstress	ln sstress	25-25-2 K	lnK	T	1/T	C	srate	ln srate
2.26336	0.81685	4.27999	1.45395	298.15	0.00335	25	0.46801	-0.7593
4.00803	1.3883	4.27999	1.45395	298.15	0.00335	25	0.93602	-0.0661
7.29305	1.98692	4.27999	1.45395	298.15	0.00335	25	1.87204	0.62703
13.6273	2.61208	4.27999	1.45395	298.15	0.00335	25	3.74407	1.32017
25.95	3.25617	4.27999	1.45395	298.15	0.00335	25	7.48814	2.01332
51.8529	3.94841	4.27999	1.45395	298.15	0.00335	25	14.9763	2.70647
95.9884	4.56423	4.27999	1.45395	298.15	0.00335	25	29.9526	3.39962

sstress	ln sstress	25-25-1 K	lnK	T	1/T	C	srate	ln srate
2.24764	0.80988	4.25536	1.44818	298.15	0.00335	25	0.46801	-0.7593
3.9766	1.38043	4.25536	1.44818	298.15	0.00335	25	0.93602	-0.0661
7.26161	1.9826	4.25536	1.44818	298.15	0.00335	25	1.87204	0.62703
13.5802	2.60861	4.25536	1.44818	298.15	0.00335	25	3.74407	1.32017
25.9972	3.25799	4.25536	1.44818	298.15	0.00335	25	7.48814	2.01332
50.2969	3.91794	4.25536	1.44818	298.15	0.00335	25	14.9763	2.70647
95.4855	4.55897	4.25536	1.44818	298.15	0.00335	25	29.9526	3.39962

sstress	ln sstress	25-25-2 K	lnK	T	1/T	C	srate	ln srate
2.3891	0.87092	4.38426	1.47802	298.15	0.00335	25	0.46801	-0.7593
4.08662	1.40772	4.38426	1.47802	298.15	0.00335	25	0.93602	-0.0661
7.32448	1.99122	4.38426	1.47802	298.15	0.00335	25	1.87204	0.62703
13.4701	2.60047	4.38426	1.47802	298.15	0.00335	25	3.74407	1.32017
25.5099	3.23907	4.38426	1.47802	298.15	0.00335	25	7.48814	2.01332
48.7722	3.88716	4.38426	1.47802	298.15	0.00335	25	14.9763	2.70647
92.3733	4.52584	4.38426	1.47802	298.15	0.00335	25	29.9526	3.39962

sstress	ln sstress	25-25-3 K	lnK	T	1/T	C	srate	ln srate
2.35767	0.85767	4.18732	1.43206	298.15	0.00335	25	0.46801	-0.7593
3.89801	1.36047	4.18732	1.43206	298.15	0.00335	25	0.93602	-0.0661
6.85295	1.92468	4.18732	1.43206	298.15	0.00335	25	1.87204	0.62703
12.3856	2.51653	4.18732	1.43206	298.15	0.00335	25	3.74407	1.32017
23.2623	3.14683	4.18732	1.43206	298.15	0.00335	25	7.48814	2.01332
44.4656	3.79472	4.18732	1.43206	298.15	0.00335	25	14.9763	2.70647
84.6245	4.43822	4.18732	1.43206	298.15	0.00335	25	29.9526	3.39962

sstress	ln sstress	25-35-1 K	lnK	T	1/T	C	srate	ln srate
5.0454	1.61848	9.38047	2.23863	298.15	0.00335	35	0.46801	-0.7593
8.84911	2.18032	9.38047	2.23863	298.15	0.00335	35	0.93602	-0.0661
15.6077	2.74777	9.38047	2.23863	298.15	0.00335	35	1.87204	0.62703
28.1505	3.33757	9.38047	2.23863	298.15	0.00335	35	3.74407	1.32017
51.68	3.94507	9.38047	2.23863	298.15	0.00335	35	7.48814	2.01332
95.1868	4.55584	9.38047	2.23863	298.15	0.00335	35	14.9763	2.70647

sstress	ln sstress	25-35-2 K	lnK	T	1/T	C	srate	ln srate
1.82339	0.6007	11.2379	2.41929	298.15	0.00335	35	0.46801	-0.7593
2.35431	0.85625	11.2379	2.41929	298.15	0.00335	35	0.93602	-0.0661
2.90751	1.0673	11.2379	2.41929	298.15	0.00335	35	1.87204	0.62703
3.48234	1.2477	11.2379	2.41929	298.15	0.00335	35	3.74407	1.32017
4.08478	1.40727	11.2379	2.41929	298.15	0.00335	35	7.48814	2.01332

sstress	ln sstress	25-35-3 K	lnK	T	1/T	C	srate	ln srate
5.86273	1.76862	10.7634	2.37615	298.15	0.00335	35	0.46801	-0.7593
10.1851	2.32093	10.7634	2.37615	298.15	0.00335	35	0.93602	-0.0661
17.7296	2.87524	10.7634	2.37615	298.15	0.00335	35	1.87204	0.62703
31.4355	3.44794	10.7634	2.37615	298.15	0.00335	35	3.74407	1.32017
56.9926	4.04292	10.7634	2.37615	298.15	0.00335	35	7.48814	2.01332

sstress	ln sstress	25-25-7 K	lnK	T	1/T	C	srate	ln srate
2.26336	0.81685	4.29066	1.45644	298.15	0.00335	25	0.46801	-0.7593
4.00803	1.3883	4.29066	1.45644	298.15	0.00335	25	0.93602	-0.0661
7.29305	1.98692	4.29066	1.45644	298.15	0.00335	25	1.87204	0.62703
13.6273	2.61208	4.29066	1.45644	298.15	0.00335	25	3.74407	1.32017
25.95	3.25617	4.29066	1.45644	298.15	0.00335	25	7.48814	2.01332

sstress	ln sstress	25-25-8 K	lnK	T	1/T	C	srate	ln srate
2.24764	0.80988	4.25536	1.44818	298.15	0.00335	25	0.46801	-0.7593
3.9766	1.38043	4.25536	1.44818	298.15	0.00335	25	0.93602	-0.0661
7.26161	1.9826	4.25536	1.44818	298.15	0.00335	25	1.87204	0.62703
13.5802	2.60861	4.25536	1.44818	298.15	0.00335	25	3.74407	1.32017
25.9972	3.25799	4.25536	1.44818	298.15	0.00335	25	7.48814	2.01332

X. APPENDIX 4. MEASUREMENTS PERFORMED AT 40°C.

1.- Mixer Viscometry, 0%, 0 g corn syrup

rpm		readings							Average
1	0.2	0.2	0.1	0.2	0.1	0.2	0.2	0.2	0.175
2	0.2	0.2	0.2	0.3	0.2	0.3	0.2	0.2	0.225
4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
8	0.6	0.7	0.7	0.6	0.7	0.7	0.7	0.7	0.675
16	1.3	1.3	1.3	1.4	1.3	1.4	1.3	1.3	1.325
32	2.6	2.7	2.6	2.7	2.6	2.6	2.7	2.6	2.6375
64	5.3	5.4	5.3	5.4	5.2	5.4	5.3	5.3	5.325
128	10.8	10.8	10.9	10.9	10.9	10.9	10.9	10.9	10.875
256	23.4	23.4	23.4	23.4	23.5	23.5	23.5	23.5	23.45
512	53.5	53.6	53.6	53.6	53.6	53.6	53.6	53.6	53.588
256	23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.2
128	10.9	10.9	10.9	10.8	10.8	10.8	10.9	10.9	10.863
64	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
32	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
16	1.4	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.375
8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
2	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2375
1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

rpm	rad/s omega	(N cm) M	(N m) M	log Om	log M
1	0.1047	0.0025	3E-05	-0.98	-4.602
2	0.2094	0.0032	3E-05	-0.679	-4.493
4	0.4188	0.0057	6E-05	-0.378	-4.243
8	0.8376	0.0096	1E-04	-0.077	-4.016
16	1.6752	0.0189	0.0002	0.2241	-3.723
32	3.3504	0.0377	0.0004	0.5251	-3.424
64	6.7009	0.0761	0.0008	0.8261	-3.119
128	13.402	0.1554	0.0016	1.1272	-2.809
256	26.803	0.335	0.0034	1.4282	-2.475
512	53.607	0.7656	0.0077	1.7292	-2.116
256	26.803	0.3315	0.0033	1.4282	-2.48
128	13.402	0.1552	0.0016	1.1272	-2.809
64	6.7009	0.0757	0.0008	0.8261	-3.121
32	3.3504	0.0386	0.0004	0.5251	-3.414
16	1.6752	0.0196	0.0002	0.2241	-3.707
8	0.8376	0.01	0.0001	-0.077	-4
4	0.4188	0.0057	6E-05	-0.378	-4.243
2	0.2094	0.0034	3E-05	-0.679	-4.469
1	0.1047	0.0014	1E-05	-0.98	-4.845

Determination of average shear rate.
average shear stress = 2 M / pi b d^2 b = 0.02692 m
average shear rate = 4.47 angular velocity d = 0.04143 m
average app. viscosity = shear stress / shear rate
K = consistency coefficient, Pa.s^n
k' = 4.47
average shear stress = 2 M / (pi d^3 * (b/d + 1/3))
(b/d + 1/3) = 0.9831
s.stress = M 9106.2
Maximum torque= 1.428716915 Nm (MM)

rpm	angular velocit rad/s	KG^(n-1) average viscosi Pa.s	average shear rate	average shear stress	Lnshear stress	Lnshear rate	Sigma/ Gamma average viscosi Pa.s	1/3 average shear stress	Ln 1/3 average shear stress
1	0.1047	0.3248	0.468	0.2277	-1.48	-0.759	0.4865	0.2238	-1.497
2	0.2094	0.3134	0.936	0.2927	-1.229	-0.066	0.3127	0.2878	-1.246
4	0.4188	0.3023	1.8721	0.5204	-0.653	0.627	0.278	0.5116	-0.67
8	0.8376	0.2917	3.7441	0.8782	-0.13	1.3202	0.2346	0.8633	-0.147
16	1.6752	0.2814	7.4882	1.7238	0.5446	2.0133	0.2302	1.6947	0.5275
32	3.3504	0.2715	14.976	3.4314	1.233	2.7065	0.2291	3.3734	1.2159
64	6.7009	0.262	29.953	6.9279	1.9356	3.3996	0.2313	6.8108	1.9185
128	13.402	0.2527	59.906	14.149	2.6496	4.0928	0.2362	13.909	2.6326
256	26.803	0.2438	119.81	30.509	3.418	4.7859	0.2546	29.993	3.401
512	53.607	0.2353	239.62	69.718	4.2445	5.4791	0.2909	68.54	4.2274
						x			y

Regression Statistics

R Square	0.9902
Observations	10

		Coeffici	Standar	t Statis	P-value	Lower 95%	Upper 95%
K = 0.3071	Interce	-1.181	0.1021	-11.56	1E-06	-1.416	-0.945
	x1	0.9394	0.0331	28.412	4E-10	0.8632	1.0157

2.- Mixer Viscometry, 0%, 0 g corn syrup

rpm	readings								Average
1	0	0.1	0	0	0	0	0.1	0	0.025
2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
4	0.3	0.3	0.2	0.2	0.3	0.2	0.3	0.3	0.2625
8	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
16	1.3	1.2	1.3	1.2	1.2	1.3	1.3	1.3	1.2625
32	2.6	2.6	2.5	2.5	2.6	2.5	2.7	2.5	2.5625
64	5.2	5.3	5.3	5.3	5.3	5.2	5.2	5.3	5.2625
128	10.9	10.7	10.8	10.9	10.8	10.9	10.9	10.9	10.85
256	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5
512	53.9	53.8	53.9	54	53.9	53.7	53.8	53.9	53.863
256	23.5	23.5	23.4	23.6	23.5	23.6	23.5	23.6	23.525
128	10.7	10.8	10.8	10.7	10.8	10.7	10.8	10.9	10.775
64	5.1	5.3	5.1	5.2	5.2	5.3	5.1	5.1	5.175
32	2.5	2.5	2.5	2.6	2.6	2.6	2.6	2.5	2.55
16	1.3	1.3	1.2	1.2	1.2	1.2	1.3	1.2	1.2375
8	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
1	0	0	0.1	0.1	0	0	0	0.1	0.0375

rpm	rad/s omega	(N cm) M	(N m) M	log om	log M
1	0.1047	0.0004	4E-06	-0.98	-5.447
2	0.2094	0.0014	1E-05	-0.679	-4.845
4	0.4188	0.0038	4E-05	-0.378	-4.426
8	0.8376	0.0086	9E-05	-0.077	-4.067
16	1.6752	0.018	0.0002	0.2241	-3.744
32	3.3504	0.0366	0.0004	0.5251	-3.436
64	6.7009	0.0752	0.0008	0.8261	-3.124
128	13.402	0.155	0.0016	1.1272	-2.81
256	26.803	0.3357	0.0034	1.4282	-2.474
512	53.607	0.7695	0.0077	1.7292	-2.114
256	26.803	0.3361	0.0034	1.4282	-2.474
128	13.402	0.1539	0.0015	1.1272	-2.813
64	6.7009	0.0739	0.0007	0.8261	-3.131
32	3.3504	0.0364	0.0004	0.5251	-3.439
16	1.6752	0.0177	0.0002	0.2241	-3.753
8	0.8376	0.0086	9E-05	-0.077	-4.067
4	0.4188	0.0043	4E-05	-0.378	-4.368
2	0.2094	0.0014	1E-05	-0.679	-4.845
1	0.1047	0.0005	5E-06	-0.98	-5.271

Determination of average shear rate
average shear stress = 2 M / pi b d^2 b = 0.02692 m
average shear rate = 4.47 angular velocity d = 0.04143 m
average app. viscosity = shear stress / shear rate
K = consistency coefficient, Pa.s^n
k' = 4.47
average shear stress = 2 M / (pi d^3 * (b/d + 1/3))
(b/d + 1/3) = 0.9831
s.stress = M 9106.2 (d108)
Maximum torque= 1.428716915 Nm (MM)

rpm	angular velocit	average shear	average shear	Lnshear	Lnshear	Sigma/ Gamma average viscosi
1	rad/s	rate	stress	stress	rate	Pa.s
1	0.1047	0.468	0.0325	-3.426	-0.759	0.0695
2	0.2094	0.936	0.1301	-2.039	-0.066	0.139
4	0.4188	1.8721	0.3415	-1.074	0.627	0.1824
8	0.8376	3.7441	0.7806	-0.248	1.3202	0.2085
16	1.6752	7.4882	1.6425	0.4962	2.0133	0.2193
32	3.3504	14.976	3.3338	1.2041	2.7065	0.2226
64	6.7009	29.953	6.8466	1.9238	3.3996	0.2286
128	13.402	59.906	14.116	2.6473	4.0928	0.2356
256	26.803	119.81	30.574	3.4201	4.7859	0.2552
512	53.607	239.62	70.076	4.2496	5.4791	0.2924
				y	x	

Regression Statistics

R Square	0.9917
Observations	10

		Coeffici	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.1311	Interce	-2.032	0.1163	-17.47	3E-08	-2.3	-1.763
	x1	1.164	0.0377	30.897	2E-10	1.0771	1.2509

3.- Mixer Viscometry, 0%, 65.4 g corn syrup, T = 40.8°C, 22.1 g CaCO3

rpm	readings								Average
1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.125
2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
8	0.8	0.7	0.8	0.7	0.8	0.7	0.7	0.7	0.7375
16	1.3	1.4	1.4	1.3	1.4	1.4	1.4	1.4	1.375
32	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
64	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
128	11	11	11	11	11	11	11	11	11
256	24	24	24	24	24	24	24	24	24
512	54.6	54.7	54.7	54.7	54.7	54.7	54.7	54.7	54.688
256	24	24	24	24	24	24	24	24	24
128	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1
64	5.4	5.4	5.4	5.3	5.3	5.3	5.3	5.3	5.3375
32	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
16	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2875
8	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
1	0	0	0	0	0	0	0	0	0

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	log Om	log M
1	0.1047	0.0018	2E-05	-0.98	-4.748
2	0.2094	0.0029	3E-05	-0.679	-4.544
4	0.4188	0.0057	6E-05	-0.378	-4.243
8	0.8376	0.0105	0.0001	-0.077	-3.977
16	1.6752	0.0196	0.0002	0.2241	-3.707
32	3.3504	0.0371	0.0004	0.5251	-3.43
64	6.7009	0.0757	0.0008	0.8261	-3.121
128	13.402	0.1572	0.0016	1.1272	-2.804
256	26.803	0.3429	0.0034	1.4282	-2.465
512	53.607	0.7813	0.0078	1.7292	-2.107
256	26.803	0.3429	0.0034	1.4282	-2.465
128	13.402	0.1586	0.0016	1.1272	-2.8
64	6.7009	0.0763	0.0008	0.8261	-3.118
32	3.3504	0.0371	0.0004	0.5251	-3.43
16	1.6752	0.0184	0.0002	0.2241	-3.735
8	0.8376	0.0086	9E-05	-0.077	-4.067
4	0.4188	0.0043	4E-05	-0.378	-4.368
2	0.2094	0.0014	1E-05	-0.679	-4.845
1	0.1047	0	0	-0.98	ERR

Determination of average shear rate.
average shear stress = 2 M / pi b d^2 b = 0.02692 m
average shear rate = 4.47 angular velocity d = 0.04143 m
average app. viscosity = shear stress / shear rate
K = consistency coefficient, Pa.s^n
k' = 4.47
average shear stress = 2 M / (pi d^3 * (b/d + 1/3))
(b/d + 1/3) = 0.9831
s.stress = M 9106.2 (d108)
Maximum torque= 1.428716915 Nm (MM)

	angular velocit	average shear	average shear	Lnshear	Lnshear	Sigma/ Gamma viscos
rpm	rad/s	rate	stress	rate	stress	Pa.s
1	0.1047	0.468	0.1626	-0.759	-1.816	0.3475
2	0.2094	0.936	0.2602	-0.066	-1.346	0.278
4	0.4188	1.8721	0.5204	0.627	-0.653	0.278
8	0.8376	3.7441	0.9595	1.3202	-0.041	0.2563
16	1.6752	7.4882	1.7889	2.0133	0.5816	0.2389
32	3.3504	14.976	3.3826	2.7065	1.2187	0.2259
64	6.7009	29.953	6.8954	3.3996	1.9309	0.2302
128	13.402	59.906	14.311	4.0928	2.661	0.2389
256	26.803	119.81	31.224	4.7859	3.4412	0.2606
512	53.607	239.62	71.149	5.4791	4.2648	0.2969
				x	y	

Regression Statistics

R Square	0.9965
Observations	10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.2798	Interce	-1.274	0.0628	-20.28	8E-09	-1.419	-1.129
	x1	0.9737	0.0203	47.857	4E-12	0.9268	1.0207

4.- Mixer Viscometry, 5%, 61.7 g corn syrup, T = 40°C, 3.1 g CaCO3

rpm	readings								Average
1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
16	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
32	3.2	3.4	3.2	3.3	3.3	3.4	3.2	3.3	3.2875
64	6.7	6.7	6.7	6.7	6.6	6.7	6.6	6.7	6.675
128	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.3	13.475
256	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4
512	58.5	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.588
256	27.8	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.712
128	13.5	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.413
64	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
32	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
16	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	log Om	log M
1	0.1047	0.0014	1E-05	-0.98	-4.845
2	0.2094	0.0029	3E-05	-0.679	-4.544
4	0.4188	0.0057	6E-05	-0.378	-4.243
8	0.8376	0.0114	0.0001	-0.077	-3.942
16	1.6752	0.0229	0.0002	0.2241	-3.641
32	3.3504	0.047	0.0005	0.5251	-3.328
64	6.7009	0.0954	0.001	0.8261	-3.021
128	13.402	0.1925	0.0019	1.1272	-2.716
256	26.803	0.4058	0.0041	1.4282	-2.392
512	53.607	0.837	0.0084	1.7292	-2.077
256	26.803	0.3959	0.004	1.4282	-2.402
128	13.402	0.1916	0.0019	1.1272	-2.718
64	6.7009	0.0943	0.0009	0.8261	-3.026
32	3.3504	0.0471	0.0005	0.5251	-3.327
16	1.6752	0.0229	0.0002	0.2241	-3.641
8	0.8376	0.0114	0.0001	-0.077	-3.942
4	0.4188	0.0057	6E-05	-0.378	-4.243
2	0.2094	0.0029	3E-05	-0.679	-4.544
1	0.1047	0.0014	1E-05	-0.98	-4.845

Determination of average shear rate.
average shear stress = 2 M / pi b d^2   b = 0.02692 m
average shear rate = 4.47 angular velocity   d = 0.04143 m
average app. viscosity = shear stress / shear rate
K = consistency coefficient, Pa.s^n
k' = 4.47
average shear stress = 2 M / (pi d^3 * (b/d + 1/3))
(b/d + 1/3) = 0.9831
s.stress = M 9106.2 (d108)
Maximum torque= 1.428716915 Nm (MM)

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.1301	-0.759	-2.039	0.278
2	0.2094	0.936	0.2602	-0.066	-1.346	0.278
4	0.4188	1.8721	0.5204	0.627	-0.653	0.278
8	0.8376	3.7441	1.0408	1.3202	0.04	0.278
16	1.6752	7.4882	2.0816	2.0133	0.7331	0.278
32	3.3504	14.976	4.2771	2.7065	1.4533	0.2856
64	6.7009	29.953	8.6843	3.3996	2.1615	0.2899
128	13.402	59.906	17.531	4.0928	2.864	0.2926
256	26.803	119.81	36.949	4.7859	3.6095	0.3084
512	53.607	239.62	76.223	5.4791	4.3337	0.3181
				x	y	

Regression Statistics
R Square 0.9999
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.2745	Interce	-1.293	0.0116	-111.7	2E-15	-1.319	-1.266
	x1	1.0205	0.0037	272.19	6E-19	1.0119	1.0292

5.- Mixer Viscometry, 5%, 64.3 g corn syrup, T = 40°C, 3.2 g CaCO3

rpm	readings								Average
1	0	0.1	0	0.1	0	0	0	0	0.025
2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
4	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3125
8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
16	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
32	3	3	3	3	3	3	3	3	3
64	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
128	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2
256	27.8	27.9	27.9	27.9	27.9	27.9	27.9	27.9	27.887
512	58.9	58.9	58.9	58.9	59	59	59	58.9	58.938
256	28.2	28.2	28.2	28.2	28.2	28.2	28.2	28.2	28.2
128	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2
64	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
32	3	3	3	3	3	3	3	3	3
16	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3125
8	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
4	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1125
2	0.1	0.1	0	0.1	0	0.1	0	0.1	0.0625
1	0	0	0	0	0	0	0	0	0

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	log Om	log M
1	0.1047	0.0004	4E-06	-0.98	-5.447
2	0.2094	0.0014	1E-05	-0.679	-4.845
4	0.4188	0.0045	4E-05	-0.378	-4.35
8	0.8376	0.01	0.0001	-0.077	-4
16	1.6752	0.02	0.0002	0.2241	-3.699
32	3.3504	0.0429	0.0004	0.5251	-3.368
64	6.7009	0.09	0.0009	0.8261	-3.046
128	13.402	0.1886	0.0019	1.1272	-2.724
256	26.803	0.3984	0.004	1.4282	-2.4
512	53.607	0.8421	0.0084	1.7292	-2.075
256	26.803	0.4029	0.004	1.4282	-2.395
128	13.402	0.1886	0.0019	1.1272	-2.724
64	6.7009	0.09	0.0009	0.8261	-3.046
32	3.3504	0.0429	0.0004	0.5251	-3.368
16	1.6752	0.0188	0.0002	0.2241	-3.727
8	0.8376	0.0071	7E-05	-0.077	-4.146
4	0.4188	0.0016	2E-05	-0.378	-4.794
2	0.2094	0.0009	9E-06	-0.679	-5.049
1	0.1047	0	0	-0.98	ERR

Determination of average shear rate.
average shear stress = 2 M / pi b d^2 b = 0.02692 m
average shear rate = 4.47 angular velocity d = 0.04143 m
average app. viscosity = shear stress / shear rate
K = consistency coefficient, Pa.s^n
k' = 4.47
average shear stress = 2 M / (pi d^3 * (b/d + 1/3))
(b/d + 1/3) = 0.9831
s.stress = M 9106.2 (d108)
Maximum torque= 1.428716915 Nm (MM)

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.1301	-0.759	-2.039	0.278
2	0.2094	0.936	0.4066	-0.066	-0.9	0.4344
4	0.4188	1.8721	0.9107	0.627	-0.094	0.4865
8	0.8376	3.7441	1.8214	1.3202	0.5996	0.4865
16	1.6752	7.4882	3.903	2.0133	1.3618	0.5212
32	3.3504	14.976	8.1964	2.7065	2.1037	0.5473
64	6.7009	29.953	17.173	3.3996	2.8434	0.5733
128	13.402	59.906	36.282	4.0928	3.5913	0.6057
256	26.803	119.81	76.679	4.7859	4.3396	0.64
512	53.607	239.62	36.689	5.4791	3.6025	0.1531
				x	y	

Regression Statistics
R Square 0.9574
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.4502	Interce	-0.798	0.2281	-3.498	0.0067	-1.324	-0.272
	x1	0.9911	0.0739	13.413	3E-07	0.8207	1.1615

6.- Mixer Viscometry, 5%, 63.6 g corn syrup, T = 40°C, 3.1 g CaCO3

rpm		readings							Average
1	0	0	0	0	0	0	0	0	0
2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
4	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.1875
8	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.5	0.575
16	1.3	1.2	1.3	1.3	1.2	1.3	1.3	1.3	1.275
32	2.8	2.9	2.8	2.9	2.8	2.9	2.8	2.9	2.85
64	6.2	6	6.1	6	6	6.1	6	6.1	6.0625
128	12.9	12.8	12.9	12.7	12.8	12.8	12.7	12.8	12.8
256	27.3	27.2	27.3	27.2	27.2	27.2	27.2	27.3	27.238
512	58.2	58.1	58.2	58.1	58.1	58.2	58.2	58.1	58.15
256	27.3	27.2	27.3	27.2	27.2	27.2	27.2	27.3	27.238
128	12.8	12.7	12.8	12.8	12.7	12.8	12.7	12.8	12.763
64	6	6.1	6.2	6	6.1	6.1	6	6.1	6.075
32	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
16	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
8	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
1	0	0	0	0.1	0	0.1	0	0	0.025

rpm	rad/s omega	(N cm) M	(N m) M	log Om	log M
1	0.1047	0	0	-0.98	ERR
2	0.2094	0.0014	1E-05	-0.679	-4.845
4	0.4188	0.0027	3E-05	-0.378	-4.572
8	0.8376	0.0082	8E-05	-0.077	-4.085
16	1.6752	0.0182	0.0002	0.2241	-3.74
32	3.3504	0.0407	0.0004	0.5251	-3.39
64	6.7009	0.0866	0.0009	0.8261	-3.062
128	13.402	0.1829	0.0018	1.1272	-2.738
256	26.803	0.3891	0.0039	1.4282	-2.41
512	53.607	0.8308	0.0083	1.7292	-2.081
256	26.803	0.3891	0.0039	1.4282	-2.41
128	13.402	0.1823	0.0018	1.1272	-2.739
64	6.7009	0.0868	0.0009	0.8261	-3.062
32	3.3504	0.04	0.0004	0.5251	-3.398
16	1.6752	0.0171	0.0002	0.2241	-3.766
8	0.8376	0.0057	6E-05	-0.077	-4.243
4	0.4188	0.0029	3E-05	-0.378	-4.544
2	0.2094	0.0014	1E-05	-0.679	-4.845
1	0.1047	0.0004	4E-06	-0.98	-5.447

Determination of average shear rate.
average shear stress = 2 M / pi b d^2 b = 0.02692 m
average shear rate = 4.47 angular velocity d = 0.04143 m
average app. viscosity = shear stress / shear rate
K = consistency coefficient, Pa.s^n
k' = 4.47
average shear stress = 2 M / (pi d^3 * (b/d + 1/3))
(b/d + 1/3) = 0.9831
s.stress = M 9106.2 (d108)
Maximum torque= 1.428716915 Nm (MM)

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0	-0.759	ERR	0
2	0.2094	0.936	0.1301	-0.066	-2.039	0.139
4	0.4188	1.8721	0.2439	0.627	-1.411	0.1303
8	0.8376	3.7441	0.7481	1.3202	-0.29	0.1998
16	1.6752	7.4882	1.6588	2.0133	0.5061	0.2215
32	3.3504	14.976	3.7079	2.7065	1.3105	0.2476
64	6.7009	29.953	7.8874	3.3996	2.0653	0.2633
128	13.402	59.906	16.653	4.0928	2.8126	0.278
256	26.803	119.81	35.436	4.7859	3.5677	0.2958
512	53.607	239.62	75.654	5.4791	4.3262	0.3157
				x	y	

Regression Statistics

R Square	0.9976
Observations	9

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.1453	Interce	-1.929	0.0692	-27.88	3E-09	-2.093	-1.765
	x1	1.1581	0.0213	54.318	1E-11	1.1077	1.2085

7.- Mixer Viscometry, 15%, 58.7 g corn syrup, T = 40.8°C, 8.8 g CaCO3

rpm	readings								Average
1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.125
2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
4	0.6	0.7	0.6	0.7	0.7	0.6	0.6	0.6	0.6375
8	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
16	2.6	2.6	2.6	2.6	2.6	2.5	2.5	2.5	2.5625
32	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
64	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
128	20.3	20.3	20.3	20.3	20.2	20.2	20.2	20.2	20.25
256	39.8	39.9	39.9	39.9	39.8	39.5	39.4	39.4	39.7
512	75	75	74.9	74.9	74.9	74.9	74.9	74.9	74.925
256	36.3	36.3	36.3	36.4	36.4	36.4	36.4	36.4	36.362
128	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.3	19.388
64	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
32	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
16	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
8	1.3	1.4	1.3	1.3	1.4	1.3	1.3	1.3	1.325
4	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

rpm	rad/s omega	(N cm) M	(N m) M	log Om	log M
1	0.1047	0.0018	2E-05	-0.98	-4.748
2	0.2094	0.0043	4E-05	-0.679	-4.368
4	0.4188	0.0091	9E-05	-0.378	-4.041
8	0.8376	0.0186	0.0002	-0.077	-3.731
16	1.6752	0.0366	0.0004	0.2241	-3.436
32	3.3504	0.0729	0.0007	0.5251	-3.137
64	6.7009	0.1457	0.0015	0.8261	-2.836
128	13.402	0.2893	0.0029	1.1272	-2.539
256	26.803	0.5672	0.0057	1.4282	-2.246
512	53.607	1.0705	0.0107	1.7292	-1.97
256	26.803	0.5195	0.0052	1.4282	-2.284
128	13.402	0.277	0.0028	1.1272	-2.558
64	6.7009	0.1414	0.0014	0.8261	-2.849
32	3.3504	0.0729	0.0007	0.5251	-3.137
16	1.6752	0.0371	0.0004	0.2241	-3.43
8	0.8376	0.0189	0.0002	-0.077	-3.723
4	0.4188	0.01	0.0001	-0.378	-4
2	0.2094	0.0057	6E-05	-0.679	-4.243
1	0.1047	0.0029	3E-05	-0.98	-4.544

Determination of average shear rate.
average shear stress = 2 M / pi b d^2 b = 0.02692 m
average shear rate = 4.47 angular velocity d = 0.04143 m
average app. viscosity = shear stress / shear rate
K = consistency coefficient, Pa.s^n
k' = 4.47
average shear stress = 2 M / (pi d^3 * (b/d + 1/3))
(b/d + 1/3) = 0.9831
s.stress = M 9106.2 (d108)
Maximum torque= 1.428716915 Nm (MM)

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.1626	-0.759	-1.816	0.3475
2	0.2094	0.936	0.3903	-0.066	-0.941	0.417
4	0.4188	1.8721	0.8294	0.627	-0.187	0.443
8	0.8376	3.7441	1.6913	1.3202	0.5255	0.4517
16	1.6752	7.4882	3.3338	2.0133	1.2041	0.4452
32	3.3504	14.976	6.6352	2.7065	1.8924	0.443
64	6.7009	29.953	13.27	3.3996	2.5855	0.443
128	13.402	59.906	26.346	4.0928	3.2713	0.4398
256	26.803	119.81	51.65	4.7859	3.9445	0.4311
512	53.607	239.62	97.478	5.4791	4.5796	0.4068
				x	y	

Regression Statistics
R Square 0.9988
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.4123	Interce	-0.886	0.038	-23.34	2E-09	-0.974 -	0.798
	x1	1.0136	0.0123	82.429	3E-14	0.9852	1.0419

8.- Mixer Viscometry, 15%, 15.02%, 61.9 g corn syrup, T = 40°C, 9.3 g CaCO3

rpm	readings								Average
1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2	0.2	0.3	0.2	0.3	0.3	0.2	0.2	0.2	0.2375
4	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
8	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
16	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.4875
32	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
64	10.2	10.3	10.2	10.3	10.3	10.3	10.3	10.3	10.275
128	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
256	41.3	41.3	41.3	41.3	41.3	41.3	41.3	41.3	41.3
512	78.1	78	77.9	77.9	77.9	77.9	77.9	77.8	77.925
256	37.5	37.4	37.4	37.4	37.4	37.5	37.4	37.5	37.438
128	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5
64	10	10	10	10	10	10	10	10	10
32	5.1	5.1	5.1	5	5.1	5	5.1	5	5.0625
16	2.5	2.5	2.5	2.5	2.5	2.5	2.6	2.6	2.525
8	1.3	1.3	1.2	1.3	1.2	1.3	1.2	1.3	1.2625
4	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.125

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	log Om	log M
1	0.1047	0.0014	1E-05	-0.98	-4.845
2	0.2094	0.0034	3E-05	-0.679	-4.469
4	0.4188	0.0086	9E-05	-0.378	-4.067
8	0.8376	0.0171	0.0002	-0.077	-3.766
16	1.6752	0.0355	0.0004	0.2241	-3.449
32	3.3504	0.0729	0.0007	0.5251	-3.137
64	6.7009	0.1468	0.0015	0.8261	-2.833
128	13.402	0.2929	0.0029	1.1272	-2.533
256	26.803	0.5901	0.0059	1.4282	-2.229
512	53.607	1.1133	0.0111	1.7292	-1.953
256	26.803	0.5349	0.0053	1.4282	-2.272
128	13.402	0.2786	0.0028	1.1272	-2.555
64	6.7009	0.1429	0.0014	0.8261	-2.845
32	3.3504	0.0723	0.0007	0.5251	-3.141
16	1.6752	0.0361	0.0004	0.2241	-3.443
8	0.8376	0.018	0.0002	-0.077	-3.744
4	0.4188	0.0086	9E-05	-0.378	-4.067
2	0.2094	0.0043	4E-05	-0.679	-4.368
1	0.1047	0.0018	2E-05	-0.98	-4.748

Determination of average shear rate.
average shear stress = 2 M / pi b d^2 b = 0.02692 m
average shear rate = 4.47 angular velocity d = 0.04143 m
average app. viscosity = shear stress / shear rate
K = consistency coefficient, Pa.s^n
k' = 4.47
average shear stress = 2 M / (pi d^3 * (b/d + 1/3))
(b/d + 1/3) = 0.9831
s.stress = M 9106.2 (d108)
Maximum torque= 1.428716915 Nm (MM)

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.1301	-0.759	-2.039	0.278
2	0.2094	0.936	0.309	-0.066	-1.174	0.3301
4	0.4188	1.8721	0.7806	0.627	-0.248	0.417
8	0.8376	3.7441	1.5612	1.3202	0.4455	0.417
16	1.6752	7.4882	3.2363	2.0133	1.1744	0.4322
32	3.3504	14.976	6.6352	2.7065	1.8924	0.443
64	6.7009	29.953	13.368	3.3996	2.5929	0.4463
128	13.402	59.906	26.671	4.0928	3.2836	0.4452
256	26.803	119.81	53.732	4.7859	3.984	0.4485
512	53.607	239.62	101.38	5.4791	4.6189	0.4231
				x	y	

Regression Statistics
R Square 0.9977
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.3532	Interce	-1.041	0.055	-18.91	1E-08	-1.168	-0.914
	x1	1.0567	0.0178	59.294	6E-13	1.0156	1.0978

9.- Mixer Viscometry, 15%, 60.7 g corn syrup, T = 40.2°C, 9.1 g CaCO3

rpm	readings								Average
1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2	0.7	0.6	0.7	0.6	0.7	0.6	0.7	0.6	0.65
4	1	1	1	1	1	1	1	1	1
8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
16	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
32	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
64	10.6	10.5	10.5	10.6	10.5	10.6	10.5	10.5	10.538
128	21.1	21.2	21.2	21.2	21.2	21.2	21.2	21.1	21.175
256	42.4	42.4	42.4	42.4	42.4	42.4	42.5	42.4	42.413
512	78.5	78.4	78.4	78.4	78.3	78.3	78.3	78.2	78.35
256	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7
128	20	20	20	20	20	20	19.9	19.9	19.975
64	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
32	5.3	5.2	5.3	5.2	5.3	5.2	5.3	5.2	5.25
16	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.8	2.7125
8	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
4	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7125
2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

rpm	rad/s omega	(N cm) M	(N m) M	log Om	log M
1	0.1047	0.0071	7E-05	-0.98	-4.146
2	0.2094	0.0093	9E-05	-0.679	-4.032
4	0.4188	0.0143	0.0001	-0.378	-3.845
8	0.8376	0.0229	0.0002	-0.077	-3.641
16	1.6752	0.0414	0.0004	0.2241	-3.383
32	3.3504	0.0757	0.0008	0.5251	-3.121
64	6.7009	0.1506	0.0015	0.8261	-2.822
128	13.402	0.3025	0.003	1.1272	-2.519
256	26.803	0.606	0.0061	1.4282	-2.218
512	53.607	1.1194	0.0112	1.7292	-1.951
256	26.803	0.5386	0.0054	1.4282	-2.269
128	13.402	0.2854	0.0029	1.1272	-2.545
64	6.7009	0.1457	0.0015	0.8261	-2.836
32	3.3504	0.075	0.0008	0.5251	-3.125
16	1.6752	0.0388	0.0004	0.2241	-3.412
8	0.8376	0.02	0.0002	-0.077	-3.699
4	0.4188	0.0102	0.0001	-0.378	-3.992
2	0.2094	0.0057	6E-05	-0.679	-4.243
1	0.1047	0.0029	3E-05	-0.98	-4.544

Determination of average shear rate.
average shear stress = 2 M / pi b d^2   b = 0.02692 m
average shear rate = 4.47 angular velocity   d = 0.04143 m
average app. viscosity = shear stress / shear rate
K = consistency coefficient, Pa.s^n
k' = 4.47
average shear stress = 2 M / (pi d^3 * (b/d + 1/3))
(b/d + 1/3) = 0.9831
s.stress = M 9106.2 (d108)
Maximum torque= 1.428716915 Nm (MM)

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.6505	-0.759	-0.43	1.3899
2	0.2094	0.936	0.8457	-0.066	-0.168	0.9035
4	0.4188	1.8721	1.301	0.627	0.2631	0.695
8	0.8376	3.7441	2.0816	1.3202	0.7331	0.556
16	1.6752	7.4882	3.7729	2.0133	1.3279	0.5039
32	3.3504	14.976	6.8954	2.7065	1.9309	0.4604
64	6.7009	29.953	13.709	3.3996	2.6181	0.4577
128	13.402	59.906	27.549	4.0928	3.316	0.4599
256	26.803	119.81	55.179	4.7859	4.0106	0.4606
512	53.607	239.62	101.93	5.4791	4.6243	0.4254
				x	y	

Regression Statistics
R Square 0.9883
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.8491	Interce	-0.164	0.1	-1.636	0.1363	-0.394	0.067
	x1	0.8416	0.0324	25.987	9E-10	0.767	0.9163

10.- Mixer Viscometry, 25%, 24.96%, 65.3 g corn syrup, T = 40.8°C, 16.3 g CaCO3

rpm	readings								Average
1	1	1	1	1	1	1	1	1	1
2	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
8	4.1	4	4	4.1	4	4.1	4	4	4.0375
16	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
32	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1
64	26.5	26.7	26.7	26.7	26.7	26.7	26.6	26.6	26.65
128	50.7	50.9	50.9	50.8	50.8	50.9	51	51	50.875
256	96.8	97	97	97	97	96.9	96.9	96.8	96.925
128	50.8	50.8	50.7	50.7	50.7	50.8	50.8	50.8	50.762
64	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5
32	14.1	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.925
16	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
8	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
4	2.3	2.3	2.3	2.4	2.3	2.4	2.4	2.3	2.3375
2	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.425
1	1	1	1	1	1	1	1	1	1

rpm	rad/s omega	(N cm) M	(N m) M	log Om	log M
1	0.1047	0.0143	0.0001	-0.98	-3.845
2	0.2094	0.0214	0.0002	-0.679	-3.669
4	0.4188	0.0343	0.0003	-0.378	-3.465
8	0.8376	0.0577	0.0006	-0.077	-3.239
16	1.6752	0.1057	0.0011	0.2241	-2.976
32	3.3504	0.2014	0.002	0.5251	-2.696
64	6.7009	0.3808	0.0038	0.8261	-2.419
128	13.402	0.7269	0.0073	1.1272	-2.139
256	26.803	1.3848	0.0138	1.4282	-1.859
128	13.402	0.7253	0.0073	1.1272	-2.14
64	6.7009	0.3786	0.0038	0.8261	-2.422
32	3.3504	0.1989	0.002	0.5251	-2.701
16	1.6752	0.1057	0.0011	0.2241	-2.976
8	0.8376	0.0586	0.0006	-0.077	-3.232
4	0.4188	0.0334	0.0003	-0.378	-3.476
2	0.2094	0.0204	0.0002	-0.679	-3.691
1	0.1047	0.0143	0.0001	-0.98	-3.845

Determination of average shear rate.
average shear stress = 2 M / pi b d^2 b = 0.02692 m
average shear rate = 4.47 angular velocity d = 0.04143 m
average app. viscosity = shear stress / shear rate
K = consistency coefficient, Pa.s^n
k' = 4.47
average shear stress = 2 M / (pi d^3 * (b/d + 1/3))
(b/d + 1/3) = 0.9831
s.stress = M 9106.2 (d108)
Maximum torque= 1.428716915 Nm (MM)

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	1.301	-0.759	0.2631	2.7799
2	0.2094	0.936	1.9515	-0.066	0.6686	2.0849
4	0.4188	1.8721	3.1224	0.627	1.1386	1.6679
8	0.8376	3.7441	5.2528	1.3202	1.6588	1.403
16	1.6752	7.4882	9.6275	2.0133	2.2646	1.2857
32	3.3504	14.976	18.344	2.7065	2.9093	1.2249
64	6.7009	29.953	34.672	3.3996	3.5459	1.1576
128	13.402	59.906	66.189	4.0928	4.1925	1.1049
256	26.803	119.81	126.1	4.7859	4.8371	1.0525
512	53.607	239.62	66.043	5.4791	4.1903	0.2756
				x	y	

Regression Statistics

R Square	0.961
Observations	10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 2.2041	Interce	0.7903	0.1654	4.777	0.001	0.4088	1.1718
	x1	0.7528	0.0536	14.05	2E-07	0.6293	0.8764

11.- Mixer Viscometry, 25%, 25.04%, 57.1 g corn syrup, T = 40°C, 14.3 g CaCO3

rpm	readings								Average
1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
4	1.2	1.1	1.1	1.1	1.1	1.2	1.2	1.1	1.1375
8	2.3	2.3	2.4	2.3	2.4	2.4	2.4	2.4	2.3625
16	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
32	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3
64	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2
128	35.3	35.3	35.3	35.3	35.3	35.3	35.3	35.3	35.3
256	66.9	66.9	66.9	66.9	66.9	66.9	66.9	66.9	66.9
128	34.5	34.5	34.5	34.5	34.5	34.5	34.6	34.6	34.525
64	18	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.913
32	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3
16	4.8	4.7	4.8	4.7	4.8	4.7	4.7	4.7	4.7375
8	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
4	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
2	0.5	0.6	0.5	0.5	0.6	0.5	0.5	6	1.2125
1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	log Om	log M
1	0.1047	0.0029	3E-05	-0.98	-4.544
2	0.2094	0.0071	7E-05	-0.679	-4.146
4	0.4188	0.0163	0.0002	-0.378	-3.789
8	0.8376	0.0338	0.0003	-0.077	-3.472
16	1.6752	0.0671	0.0007	0.2241	-3.173
32	3.3504	0.1329	0.0013	0.5251	-2.877
64	6.7009	0.26	0.0026	0.8261	-2.585
128	13.402	0.5043	0.005	1.1272	-2.297
256	26.803	0.9558	0.0096	1.4282	-2.02
128	13.402	0.4933	0.0049	1.1272	-2.307
64	6.7009	0.2559	0.0026	0.8261	-2.592
32	3.3504	0.1329	0.0013	0.5251	-2.877
16	1.6752	0.0677	0.0007	0.2241	-3.17
8	0.8376	0.0343	0.0003	-0.077	-3.465
4	0.4188	0.0171	0.0002	-0.378	-3.766
2	0.2094	0.0173	0.0002	-0.679	-3.761
1	0.1047	0.0029	3E-05	-0.98	-4.544

Determination of average shear rate.
average shear stress = 2 M / pi b d^2   b = 0.02692 m
average shear rate = 4.47 angular velocity   d = 0.04143 m
average app. viscosity = shear stress / shear rate
K = consistency coefficient, Pa.s^n
k' = 4.47
average shear stress = 2 M / (pi d^3 * (b/d + 1/3))
(b/d + 1/3) = 0.9831
s.stress = M 9106.2 (d108)
Maximum torque= 1.428716915 Nm (MM)

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.2602	-0.759	-1.346	0.556
2	0.2094	0.936	0.6505	-0.066	-0.43	0.695
4	0.4188	1.8721	1.4799	0.627	0.392	0.7905
8	0.8376	3.7441	3.0736	1.3202	1.1229	0.8209
16	1.6752	7.4882	6.1148	2.0133	1.8107	0.8166
32	3.3504	14.976	12.099	2.7065	2.4932	0.8079
64	6.7009	29.953	23.678	3.3996	3.1646	0.7905
128	13.402	59.906	45.926	4.0928	3.827	0.7666
256	26.803	119.81	87.038	4.7859	4.4663	0.7265
512	53.607	239.62	44.918	5.4791	3.8048	0.1875
				x	y	

Regression Statistics

R Square	0.9552
Observations	10

			Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K =	0.796	Interce	-0.228	0.2163	-1.055	0.3191	-0.727	0.2707
		x1	0.9147	0.0701	13.054	4E-07	0.7531	1.0763

12.- Mixer Viscometry, 25%, T=40.6°C, 59.2 g corn syrup, 14.8 22.1 g CaCO3

rpm		readings							Average
1	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.5	0.4625
2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
16	5.2	5.2	5.3	5.2	5.3	5.3	5.3	5.3	5.2625
32	10.3	10.3	10.3	10.3	10.2	10.2	10.2	10.1	10.238
64	19.7	19.7	19.7	19.7	19.7	19.7	19.7	19.7	19.7
128	37.9	37.9	37.8	37.8	37.8	37.8	37.8	37.8	37.825
256	70.6	71.1	70	70.9	70.8	70.7	70.7	70.7	70.688
128	36.7	36.7	36.7	36.7	36.7	36.7	36.7	36.7	36.7
64	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.4	19.225
32	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
16	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
2	0.8	0.9	0.9	0.8	0.9	0.8	0.9	0.8	0.85
1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	log Om	log M
1	0.1047	0.0066	7E-05	-0.98	-4.18
2	0.2094	0.0114	0.0001	-0.679	-3.942
4	0.4188	0.0214	0.0002	-0.378	-3.669
8	0.8376	0.04	0.0004	-0.077	-3.398
16	1.6752	0.0752	0.0008	0.2241	-3.124
32	3.3504	0.1463	0.0015	0.5251	-2.835
64	6.7009	0.2815	0.0028	0.8261	-2.551
128	13.402	0.5404	0.0054	1.1272	-2.267
256	26.803	1.0099	0.0101	1.4282	-1.996
128	13.402	0.5243	0.0052	1.1272	-2.28
64	6.7009	0.2747	0.0027	0.8261	-2.561
32	3.3504	0.1443	0.0014	0.5251	-2.841
16	1.6752	0.0757	0.0008	0.2241	-3.121
8	0.8376	0.04	0.0004	-0.077	-3.398
4	0.4188	0.0214	0.0002	-0.378	-3.669
2	0.2094	0.0121	0.0001	-0.679	-3.916
1	0.1047	0.0071	7E-05	-0.98	-4.146

Determination of average shear rate.
average shear stress = 2 M / pi b d^2 b = 0.02692 m
average shear rate = 4.47 angular velocity d = 0.04143 m
average app. viscosity = shear stress / shear rate
K = consistency coefficient, Pa.s^n
k' = 4.47
average shear stress = 2 M / (pi d^3 * (b/d + 1/3))
(b/d + 1/3) = 0.9831
s.stress = M 9106.2 (d108)
Maximum torque= 1.428716915 Nm (MM)

	angular velocit	average shear	average shear	Lnshear	Lnshear	Sigma/ Gamma viscos
rpm	rad/s	rate	stress	rate	stress	Pa.s
1	0.1047	0.468	0.6017	-0.759	-0.508	1.2857
2	0.2094	0.936	1.0408	-0.066	0.04	1.1119
4	0.4188	1.8721	1.9515	0.627	0.6686	1.0424
8	0.8376	3.7441	3.6428	1.3202	1.2928	0.973
16	1.6752	7.4882	6.8466	2.0133	1.9238	0.9143
32	3.3504	14.976	13.319	2.7065	2.5892	0.8893
64	6.7009	29.953	25.63	3.3996	3.2438	0.8557
128	13.402	59.906	49.211	4.0928	3.8961	0.8215
256	26.803	119.81	91.965	4.7859	4.5214	0.7676
512	53.607	239.62	47.747	5.4791	3.8659	0.1993
				x	y	

Regression Statistics

R Square	0.961
Observations	10

			Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K =	1.254	Interce	0.2263	0.1797	1.2598	0.2394	-0.188	0.6406
		x1	0.8166	0.0582	14.034	2E-07	0.6824	0.9508

12 a.- Mixer Viscometry, 25%, T= 40.2°C, 58.4 g corn syrup, 14.6 22.1 g CaCO3

rpm	readings								Average
1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
2	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
8	2.5	2.6	2.5	2.6	2.6	2.6	2.5	2.5	2.55
16	4.9	4.9	4.9	5	4.9	5	4.9	5	4.9375
32	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.6	9.6875
64	18.8	18.8	18.8	18.8	18.8	18.8	18.8	18.7	18.788
128	36.2	36.2	36.2	36.3	36.3	36.3	36.3	36.3	36.263
256	65.1	65	65	65	65	65	65	65	65.012
128	33.2	33.2	33.2	33.2	33.2	33.2	33.3	33.3	33.225
64	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7
32	9.4	9.4	9.5	9.4	9.4	9.5	9.5	9.5	9.45
16	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
8	2.6	2.6	2.6	2.5	2.6	2.5	2.6	2.6	2.575
4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3125
2	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
1	0.3	0.4	0.3	0.4	0.3	0.4	0.3	0.3	0.3375

rpm	rad/s omega	(N cm) M	(N m) M	log Om	log M
1	0.1047	0.0043	4E-05	-0.98	-4.368
2	0.2094	0.01	0.0001	-0.679	-4
4	0.4188	0.0186	0.0002	-0.378	-3.731
8	0.8376	0.0364	0.0004	-0.077	-3.439
16	1.6752	0.0705	0.0007	0.2241	-3.152
32	3.3504	0.1384	0.0014	0.5251	-2.859
64	6.7009	0.2684	0.0027	0.8261	-2.571
128	13.402	0.5181	0.0052	1.1272	-2.286
256	26.803	0.9288	0.0093	1.4282	-2.032
128	13.402	0.4747	0.0047	1.1272	-2.324
64	6.7009	0.2529	0.0025	0.8261	-2.597
32	3.3504	0.135	0.0014	0.5251	-2.87
16	1.6752	0.07	0.0007	0.2241	-3.155
8	0.8376	0.0368	0.0004	-0.077	-3.434
4	0.4188	0.0188	0.0002	-0.378	-3.727
2	0.2094	0.01	0.0001	-0.679	-4
1	0.1047	0.0048	5E-05	-0.98	-4.317

Determination of average shear rate.
average shear stress = 2 M / pi b d^2 b = 0.02692 m
average shear rate = 4.47 angular velocity d = 0.04143 m
average app. viscosity = shear stress / shear rate
K = consistency coefficient, Pa.s^n
k' = 4.47
average shear stress = 2 M / (pi d^3 * (b/d + 1/3))
(b/d + 1/3) = 0.9831
s.stress = M 9106.2 (d108)
Maximum torque= 1.428716915 Nm (MM)

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.3903	-0.759	-0.941	0.834
2	0.2094	0.936	0.9107	-0.066	-0.094	0.973
4	0.4188	1.8721	1.6913	0.627	0.5255	0.9035
8	0.8376	3.7441	3.3176	1.3202	1.1992	0.8861
16	1.6752	7.4882	6.4238	2.0133	1.86	0.8578
32	3.3504	14.976	12.604	2.7065	2.534	0.8416
64	6.7009	29.953	24.443	3.3996	3.1963	0.816
128	13.402	59.906	47.178	4.0928	3.8539	0.7875
256	26.803	119.81	84.582	4.7859	4.4377	0.706
512	53.607	239.62	43.226	5.4791	3.7664	0.1804
				x	y	

Regression Statistics
R Square 0.9558
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 1.0246	Interce	0.0243	0.1998	0.1216	0.9059	-0.437	0.4851
	x1	0.8516	0.0647	13.157	4E-07	0.7023	1.0008

13.- Mixer Viscometry, 35%, 33.945%, 65.4 g corn syrup, T = 40°C, 22.2 g CaCO3

rpm	readings								Average
1	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2375
2	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
4	5.5	5.6	5.5	5.6	5.6	5.5	5.6	5.5	5.55
8	9.3	9.2	9.2	9.3	9.2	9.2	9.2	9.2	9.225
16	16.3	16.2	16.3	16.3	16.3	16.3	16.4	16.3	16.3
32	29.2	29.2	29.2	29.2	29.2	29.1	29.2	29.1	29.175
64	52.7	52.7	52.8	52.8	52.7	52.7	52.8	52.8	52.75
128	95.9	95.9	95.8	95.9	95.8	95.9	95.9	95.9	95.875
64	52.7	52.7	52.8	52.8	52.7	52.7	52.8	52.8	52.75
32	28.7	28.7	28.6	28.6	28.7	28.7	28.7	28.7	28.675
16	15.9	15.9	15.9	15.8	15.9	15.8	15.9	15.8	15.863
8	9.1	9	9	8.9	8.9	8.9	8.9	8.9	8.95
4	5.2	5.1	5.1	5.1	5.2	5.2	5.2	5.2	5.1625
2	3.1	3.1	3.1	3.1	3	3.1	3.1	3	3.075
1	2	2	1.9	1.9	1.9	1.9	1.9	1.9	1.925

rpm	rad/s omega	(N cm) M	(N m) M	log Om	log M
1	0.1047	0.032	0.0003	-0.98	-3.495
2	0.2094	0.05	0.0005	-0.679	-3.301
4	0.4188	0.0793	0.0008	-0.378	-3.101
8	0.8376	0.1318	0.0013	-0.077	-2.88
16	1.6752	0.2329	0.0023	0.2241	-2.633
32	3.3504	0.4168	0.0042	0.5251	-2.38
64	6.7009	0.7536	0.0075	0.8261	-2.123
128	13.402	1.3698	0.0137	1.1272	-1.863
64	6.7009	0.7536	0.0075	0.8261	-2.123
32	3.3504	0.4097	0.0041	0.5251	-2.388
16	1.6752	0.2266	0.0023	0.2241	-2.645
8	0.8376	0.1279	0.0013	-0.077	-2.893
4	0.4188	0.0738	0.0007	-0.378	-3.132
2	0.2094	0.0439	0.0004	-0.679	-3.357
1	0.1047	0.0275	0.0003	-0.98	-3.561

Determination of average shear rate.
average shear stress = 2 M / pi b d^2 b = 0.02692 m
average shear rate = 4.47 angular velocity d = 0.04143 m
average app. viscosity = shear stress / shear rate
K = consistency coefficient, Pa.s^n
k' = 4.47
average shear stress = 2 M / (pi d^3 * (b/d + 1/3))
(b/d + 1/3) = 0.9831
s.stress = M 9106.2 (d108)
Maximum torque= 1.428716915 Nm (MM)

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	2.911	-0.759	1.0685	6.2199
2	0.2094	0.936	4.5535	-0.066	1.5159	4.8648
4	0.4188	1.8721	7.2206	0.627	1.9769	3.8571
8	0.8376	3.7441	12.002	1.3202	2.4851	3.2055
16	1.6752	7.4882	21.207	2.0133	3.0543	2.832
32	3.3504	14.976	37.957	2.7065	3.6365	2.5345
64	6.7009	29.953	68.628	3.3996	4.2287	2.2912
128	13.402	59.906	124.73	4.0928	4.8262	2.0822
256	26.803	119.81	68.628	4.7859	4.2287	0.5728
512	53.607	239.62	37.307	5.4791	3.6192	0.1557
				x	y	

Regression Statistics
R Square 0.8119
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 5.9571	Interce	1.7846	0.2849	6.2644	0.0001	1.1276	2.4415
	x1	0.5421	0.0923	5.8758	0.0002	0.3294	0.7549

14.- Mixer Viscometry, 35%, 35%, 62.2 g corn syrup, T = 40.8°C, 21.7 g CaCO3

rpm	readings								Average
1	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
2	2.7	2.7	2.7	2.7	2.7	2.6	2.6	2.6	2.6625
4	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
8	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
16	13.7	13.7	13.7	13.7	13.7	13.8	13.8	13.8	13.738
32	25.9	26	26	26	26.1	26.1	26.2	26.2	26.063
64	46.8	46.9	46.8	46.7	46.7	46.6	46.6	46.6	46.713
128	81.1	81.2	81.2	81.3	81.3	81.3	81.4	81.4	81.275
64	44.7	44.7	44.6	44.6	44.6	44.6	44.6	44.6	44.625
32	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6
16	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
8	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9
4	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
2	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
1	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.8	1.8125

rpm	rad/s omega	(N cm) M	(N m) M	log Om	log M
1	0.1047	0.0229	0.0002	-0.98	-3.641
2	0.2094	0.038	0.0004	-0.679	-3.42
4	0.4188	0.0643	0.0006	-0.378	-3.192
8	0.8376	0.11	0.0011	-0.077	-2.959
16	1.6752	0.1963	0.002	0.2241	-2.707
32	3.3504	0.3724	0.0037	0.5251	-2.429
64	6.7009	0.6674	0.0067	0.8261	-2.176
128	13.402	1.1612	0.0116	1.1272	-1.935
64	6.7009	0.6376	0.0064	0.8261	-2.195
32	3.3504	0.3515	0.0035	0.5251	-2.454
16	1.6752	0.1972	0.002	0.2241	-2.705
8	0.8376	0.1129	0.0011	-0.077	-2.947
4	0.4188	0.0671	0.0007	-0.378	-3.173
2	0.2094	0.0414	0.0004	-0.679	-3.383
1	0.1047	0.0259	0.0003	-0.98	-3.587

Determination of average shear rate.
average shear stress = 2 M / pi b d^2 b = 0.02692 m
average shear rate = 4.47 angular velocity d = 0.04143 m
average app. viscosity = shear stress / shear rate
K = consistency coefficient, Pa.s^n
k' = 4.47
average shear stress = 2 M / (pi d^3 * (b/d + 1/3))
(b/d + 1/3) = 0.9831
s.stress = M 9106.2 (d108)
Maximum torque= 1.428716915 Nm (MM)

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	2.0816	-0.759	0.7331	4.4478
2	0.2094	0.936	3.464	-0.066	1.2424	3.7007
4	0.4188	1.8721	5.8546	0.627	1.7672	3.1273
8	0.8376	3.7441	10.018	1.3202	2.3044	2.6756
16	1.6752	7.4882	17.873	2.0133	2.8833	2.3868
32	3.3504	14.976	33.908	2.7065	3.5236	2.2641
64	6.7009	29.953	60.774	3.3996	4.1072	2.029
128	13.402	59.906	105.74	4.0928	4.661	1.7651
256	26.803	119.81	58.058	4.7859	4.0614	0.4846
512	53.607	239.62	32.005	5.4791	3.4659	0.1336
				x	y	

Regression Statistics
R Square 0.8121
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 4.6503	Interce	1.5369	0.2978	5.1618	0.0006	0.8503	2.2235
	x1	0.567	0.0964	5.8794	0.0002	0.3446	0.7894

15.- Mixer Viscometry, 35%, 34.96%, 65.5 g corn syrup, T = 40.8°C, 22.9 g CaCO3

rpm	readings								Average
1	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
2	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
4	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
8	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
16	14.7	14.7	14.7	14.8	14.8	14.7	14.7	14.7	14.725
32	25.9	26	26	26	26.1	26.1	26.2	26.2	26.063
64	46.8	46.9	46.8	46.7	46.7	46.6	46.6	46.6	46.713
128	84.9	85	85	85	85	84.9	84.9	84.8	84.938
64	46.8	46.7	46.7	46.6	46.6	46.6	46.5	46.5	46.625
32	25.6	25.6	25.6	25.6	25.6	25.6	25.6	25.8	25.625
16	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
8	8.2	8.2	8.2	8.2	8.3	8.2	8.3	8.3	8.2375
4	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
2	3	3	3	3	3	3	3	3	3
1	2	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9125

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	log Om	log M
1	0.1047	0.0243	0.0002	-0.98	-3.615
2	0.2094	0.04	0.0004	-0.679	-3.398
4	0.4188	0.0686	0.0007	-0.378	-3.164
8	0.8376	0.1186	0.0012	-0.077	-2.926
16	1.6752	0.2104	0.0021	0.2241	-2.677
32	3.3504	0.3724	0.0037	0.5251	-2.429
64	6.7009	0.6674	0.0067	0.8261	-2.176
128	13.402	1.2135	0.0121	1.1272	-1.916
64	6.7009	0.6661	0.0067	0.8261	-2.176
32	3.3504	0.3661	0.0037	0.5251	-2.436
16	1.6752	0.2057	0.0021	0.2241	-2.687
8	0.8376	0.1177	0.0012	-0.077	-2.929
4	0.4188	0.07	0.0007	-0.378	-3.155
2	0.2094	0.0429	0.0004	-0.679	-3.368
1	0.1047	0.0273	0.0003	-0.98	-3.563

Determination of average shear rate.
average shear stress = 2 M / pi b d^2 b = 0.02692 m
average shear rate = 4.47 angular velocity d = 0.04143 m
average app. viscosity = shear stress / shear rate
K = consistency coefficient, Pa.s^n
k' = 4.47
average shear stress = 2 M / (pi d^3 * (b/d + 1/3))
(b/d + 1/3) = 0.9831
s.stress = M 9106.2 (d108)
Maximum torque= 1.428716915 Nm (MM)

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	2.2117	-0.759	0.7938	4.7258
2	0.2094	0.936	3.6428	-0.066	1.2928	3.8918
4	0.4188	1.8721	6.2449	0.627	1.8318	3.3358
8	0.8376	3.7441	10.798	1.3202	2.3794	2.8841
16	1.6752	7.4882	19.157	2.0133	2.9527	2.5583
32	3.3504	14.976	33.908	2.7065	3.5236	2.2641
64	6.7009	29.953	60.774	3.3996	4.1072	2.029
128	13.402	59.906	110.5	4.0928	4.7051	1.8446
256	26.803	119.81	60.66	4.7859	4.1053	0.5063
512	53.607	239.62	33.338	5.4791	3.5067	0.1391
				x	y	

Regression Statistics

R Square	0.814
Observations	10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 4.9264	Interce	1.5946	0.293	5.4419	0.0004	0.9189	2.2703
	x1	0.5616	0.0949	5.917	0.0002	0.3427	0.7804

XI. APPENDIX 5. CALCULATIONS TO FIT THE GLOBAL MODEL.

These calculations were used to fit a model using the values coming from the three different temperatures.

MIX40-1.WK1

	ln	40-0-1						ln
sstres	sstress	k	lnk	T	1/T	C	srate	srate
0.2277	-1.48	0.3071	-1.181	313.15	0.0032	0	0.468	-0.759
0.2927	-1.229	0.3071	-1.181	313.15	0.0032	0	0.936	-0.066
0.5204	-0.653	0.3071	-1.181	313.15	0.0032	0	1.8721	0.627
0.8782	-0.13	0.3071	-1.181	313.15	0.0032	0	3.7441	1.3202
1.7238	0.5446	0.3071	-1.181	313.15	0.0032	0	7.4882	2.0133
3.4314	1.233	0.3071	-1.181	313.15	0.0032	0	14.976	2.7065
6.9279	1.9356	0.3071	-1.181	313.15	0.0032	0	29.953	3.3996
14.149	2.6496	0.3071	-1.181	313.15	0.0032	0	59.906	4.0928
30.509	3.418	0.3071	-1.181	313.15	0.0032	0	119.81	4.7859
69.718	4.2445	0.3071	-1.181	313.15	0.0032	0	239.62	5.4791

	ln	40-0-2						ln
sstres	sstress	k	lnk	T	1/T	C	srate	srate
0.0325	-3.426	0.1311	-2.032	313.15	0.0032	0	0.468	-0.759
0.1301	-2.039	0.1311	-2.032	313.15	0.0032	0	0.936	-0.066
0.3415	-1.074	0.1311	-2.032	313.15	0.0032	0	1.8721	0.627
0.7806	-0.248	0.1311	-2.032	313.15	0.0032	0	3.7441	1.3202
1.6425	0.4962	0.1311	-2.032	313.15	0.0032	0	7.4882	2.0133
3.3338	1.2041	0.1311	-2.032	313.15	0.0032	0	14.976	2.7065
6.8466	1.9238	0.1311	-2.032	313.15	0.0032	0	29.953	3.3996
14.116	2.6473	0.1311	-2.032	313.15	0.0032	0	59.906	4.0928
30.574	3.4201	0.1311	-2.032	313.15	0.0032	0	119.81	4.7859
70.076	4.2496	0.1311	-2.032	313.15	0.0032	0	239.62	5.4791

	ln	40-0-3						ln
sstres	sstress	k	lnk	T	1/T	C	srate	srate
0.1626	-1.816	0.2798	-1.274	313.15	0.0032	0	0.468	-0.759
0.2602	-1.346	0.2798	-1.274	313.15	0.0032	0	0.936	-0.066
0.5204	-0.653	0.2798	-1.274	313.15	0.0032	0	1.8721	0.627
0.9595	-0.041	0.2798	-1.274	313.15	0.0032	0	3.7441	1.3202
1.7889	0.5816	0.2798	-1.274	313.15	0.0032	0	7.4882	2.0133
3.3826	1.2187	0.2798	-1.274	313.15	0.0032	0	14.976	2.7065
6.8954	1.9309	0.2798	-1.274	313.15	0.0032	0	29.953	3.3996
14.311	2.661	0.2798	-1.274	313.15	0.0032	0	59.906	4.0928
31.224	3.4412	0.2798	-1.274	313.15	0.0032	0	119.81	4.7859
71.149	4.2648	0.2798	-1.274	313.15	0.0032	0	239.62	5.4791

	ln	40-5-1						ln
sstres	sstress	k	lnk	T	1/T	C	srate	srate
0.1301	-2.039	0.2745	-1.293	313.15	0.0032	5	0.468	-0.759
0.2602	-1.346	0.2745	-1.293	313.15	0.0032	5	0.936	-0.066
0.5204	-0.653	0.2745	-1.293	313.15	0.0032	5	1.8721	0.627
1.0408	0.04	0.2745	-1.293	313.15	0.0032	5	3.7441	1.3202
2.0816	0.7331	0.2745	-1.293	313.15	0.0032	5	7.4882	2.0133
4.2771	1.4533	0.2745	-1.293	313.15	0.0032	5	14.976	2.7065
8.6843	2.1615	0.2745	-1.293	313.15	0.0032	5	29.953	3.3996
17.531	2.864	0.2745	-1.293	313.15	0.0032	5	59.906	4.0928
36.949	3.6095	0.2745	-1.293	313.15	0.0032	5	119.81	4.7859
76.223	4.3337	0.2745	-1.293	313.15	0.0032	5	239.62	5.4791

	ln	40-5-2						ln
sstres	sstress	k	lnk	T	1/T	C	srate	srate
0.1301	-2.039	0.4502	-0.798	313.15	0.0032	5	0.468	-0.759
0.4066	-0.9	0.4502	-0.798	313.15	0.0032	5	0.936	-0.066
0.9107	-0.094	0.4502	-0.798	313.15	0.0032	5	1.8721	0.627
1.8214	0.5996	0.4502	-0.798	313.15	0.0032	5	3.7441	1.3202
3.903	1.3618	0.4502	-0.798	313.15	0.0032	5	7.4882	2.0133
8.1964	2.1037	0.4502	-0.798	313.15	0.0032	5	14.976	2.7065
17.173	2.8434	0.4502	-0.798	313.15	0.0032	5	29.953	3.3996
36.282	3.5913	0.4502	-0.798	313.15	0.0032	5	59.906	4.0928
76.679	4.3396	0.4502	-0.798	313.15	0.0032	5	119.81	4.7859
36.689	3.6025	0.4502	-0.798	313.15	0.0032	5	239.62	5.4791

	ln	40-5-3						ln
sstres	sstress	k	lnk	T	1/T	C	srate	srate
0	ERR	0.1453	-1.929	313.15	0.0032	5	0.468	-0.759
0.1301	-2.039	0.1453	-1.929	313.15	0.0032	5	0.936	-0.066
0.2439	-1.411	0.1453	-1.929	313.15	0.0032	5	1.8721	0.627
0.7481	-0.29	0.1453	-1.929	313.15	0.0032	5	3.7441	1.3202
1.6588	0.5061	0.1453	-1.929	313.15	0.0032	5	7.4882	2.0133
3.7079	1.3105	0.1453	-1.929	313.15	0.0032	5	14.976	2.7065
7.8874	2.0653	0.1453	-1.929	313.15	0.0032	5	29.953	3.3996
16.653	2.8126	0.1453	-1.929	313.15	0.0032	5	59.906	4.0928
35.436	3.5677	0.1453	-1.929	313.15	0.0032	5	119.81	4.7859
75.654	4.3262	0.1453	-1.929	313.15	0.0032	5	239.62	5.4791

sstres	ln sstress	40-15-1 k	lnk	T	1/T	C	srate	ln srate
0.1626	-1.816	0.4123	-0.886	313.15	0.0032	15	0.468	-0.759
0.3903	-0.941	0.4123	-0.886	313.15	0.0032	15	0.936	-0.066
0.8294	-0.187	0.4123	-0.886	313.15	0.0032	15	1.8721	0.627
1.6913	0.5255	0.4123	-0.886	313.15	0.0032	15	3.7441	1.3202
3.3338	1.2041	0.4123	-0.886	313.15	0.0032	15	7.4882	2.0133
6.6352	1.8924	0.4123	-0.886	313.15	0.0032	15	14.976	2.7065
13.27	2.5855	0.4123	-0.886	313.15	0.0032	15	29.953	3.3996
26.346	3.2713	0.4123	-0.886	313.15	0.0032	15	59.906	4.0928
51.65	3.9445	0.4123	-0.886	313.15	0.0032	15	119.81	4.7859
97.478	4.5796	0.4123	-0.886	313.15	0.0032	15	239.62	5.4791

sstres	sstress	40-15-2 k	lnk	T	1/T	C	srate	ln srate
0.1301	-2.039	0.3532	-1.041	313.15	0.0032	15	0.468	-0.759
0.309	-1.174	0.3532	-1.041	313.15	0.0032	15	0.936	-0.066
0.7806	-0.248	0.3532	-1.041	313.15	0.0032	15	1.8721	0.627
1.5612	0.4455	0.3532	-1.041	313.15	0.0032	15	3.7441	1.3202
3.2363	1.1744	0.3532	-1.041	313.15	0.0032	15	7.4882	2.0133
6.6352	1.8924	0.3532	-1.041	313.15	0.0032	15	14.976	2.7065
13.368	2.5929	0.3532	-1.041	313.15	0.0032	15	29.953	3.3996
26.671	3.2836	0.3532	-1.041	313.15	0.0032	15	59.906	4.0928
53.732	3.984	0.3532	-1.041	313.15	0.0032	15	119.81	4.7859
101.38	4.6189	0.3532	-1.041	313.15	0.0032	15	239.62	5.4791

sstres	ln sstress	40-15-3 k	lnk	T	1/T	C	srate	ln srate
0.6505	-0.43	0.8491	-0.164	313.15	0.0032	15	0.468	-0.759
0.8457	-0.168	0.8491	-0.164	313.15	0.0032	15	0.936	-0.066
1.301	0.2631	0.8491	-0.164	313.15	0.0032	15	1.8721	0.627
2.0816	0.7331	0.8491	-0.164	313.15	0.0032	15	3.7441	1.3202
3.7729	1.3279	0.8491	-0.164	313.15	0.0032	15	7.4882	2.0133
6.8954	1.9309	0.8491	-0.164	313.15	0.0032	15	14.976	2.7065
13.709	2.6181	0.8491	-0.164	313.15	0.0032	15	29.953	3.3996
27.549	3.316	0.8491	-0.164	313.15	0.0032	15	59.906	4.0928
55.179	4.0106	0.8491	-0.164	313.15	0.0032	15	119.81	4.7859
101.93	4.6243	0.8491	-0.164	313.15	0.0032	15	239.62	5.4791

sstres	ln sstress	40-25-1 k	lnk	T	1/T	C	srate	ln srate
1.301	0.2631	2.2041	0.7903	313.15	0.0032	25	0.468	-0.759
1.9515	0.6686	2.2041	0.7903	313.15	0.0032	25	0.936	-0.066
3.1224	1.1386	2.2041	0.7903	313.15	0.0032	25	1.8721	0.627
5.2528	1.6588	2.2041	0.7903	313.15	0.0032	25	3.7441	1.3202
9.6275	2.2646	2.2041	0.7903	313.15	0.0032	25	7.4882	2.0133
18.344	2.9093	2.2041	0.7903	313.15	0.0032	25	14.976	2.7065
34.672	3.5459	2.2041	0.7903	313.15	0.0032	25	29.953	3.3996
66.189	4.1925	2.2041	0.7903	313.15	0.0032	25	59.906	4.0928
126.1	4.8371	2.2041	0.7903	313.15	0.0032	25	119.81	4.7859
66.043	4.1903	2.2041	0.7903	313.15	0.0032	25	239.62	5.4791

sstres	ln sstress	40-25-2 k	lnk	T	1/T	C	srate	ln srate
0.2602	-1.346	0.796	-0.228	313.15	0.0032	25	0.468	-0.759
0.6505	-0.43	0.796	-0.228	313.15	0.0032	25	0.936	-0.066
1.4799	0.392	0.796	-0.228	313.15	0.0032	25	1.8721	0.627
3.0736	1.1229	0.796	-0.228	313.15	0.0032	25	3.7441	1.3202
6.1148	1.8107	0.796	-0.228	313.15	0.0032	25	7.4882	2.0133
12.099	2.4932	0.796	-0.228	313.15	0.0032	25	14.976	2.7065
23.678	3.1646	0.796	-0.228	313.15	0.0032	25	29.953	3.3996
45.926	3.827	0.796	-0.228	313.15	0.0032	25	59.906	4.0928
87.038	4.4663	0.796	-0.228	313.15	0.0032	25	119.81	4.7859
44.918	3.8048	0.796	-0.228	313.15	0.0032	25	239.62	5.4791

sstres	ln sstress	40-25-3 k	lnk	T	1/T	C	srate	ln srate
0.6017	-0.508	1.254	0.2263	313.15	0.0032	25	0.468	-0.759
1.0408	0.04	1.254	0.2263	313.15	0.0032	25	0.936	-0.066
1.9515	0.6686	1.254	0.2263	313.15	0.0032	25	1.8721	0.627
3.6428	1.2928	1.254	0.2263	313.15	0.0032	25	3.7441	1.3202
6.8466	1.9238	1.254	0.2263	313.15	0.0032	25	7.4882	2.0133
13.319	2.5892	1.254	0.2263	313.15	0.0032	25	14.976	2.7065
25.63	3.2438	1.254	0.2263	313.15	0.0032	25	29.953	3.3996
49.211	3.8961	1.254	0.2263	313.15	0.0032	25	59.906	4.0928
91.965	4.5214	1.254	0.2263	313.15	0.0032	25	119.81	4.7859
47.747	3.8659	1.254	0.2263	313.15	0.0032	25	239.62	5.4791

sstres	ln sstress	40-25-4 k	lnk	T	1/T	C	srate	ln srate
0.3903	-0.941	1.0245	0.0242	313.15	0.0032	25	0.468	-0.759
0.9107	-0.094	1.0245	0.0242	313.15	0.0032	25	0.936	-0.066
1.6913	0.5255	1.0245	0.0242	313.15	0.0032	25	1.8721	0.627
3.3176	1.1992	1.0245	0.0242	313.15	0.0032	25	3.7441	1.3202
6.4238	1.86	1.0245	0.0242	313.15	0.0032	25	7.4882	2.0133
12.604	2.534	1.0245	0.0242	313.15	0.0032	25	14.976	2.7065
24.443	3.1963	1.0245	0.0242	313.15	0.0032	25	29.953	3.3996
47.178	3.8539	1.0245	0.0242	313.15	0.0032	25	59.906	4.0928
84.582	4.4377	1.0245	0.0242	313.15	0.0032	25	119.81	4.7859
43.226	3.7664	1.0245	0.0242	313.15	0.0032	25	239.62	5.4791

sstres	ln sstress	40-35-1 k	lnk	T	1/T	C	srate	ln srate
2.911	1.0685	5.9571	1.7846	313.15	0.0032	35	0.468	-0.759
4.5535	1.5159	5.9571	1.7846	313.15	0.0032	35	0.936	-0.066
7.2206	1.9769	5.9571	1.7846	313.15	0.0032	35	1.8721	0.627
12.002	2.4851	5.9571	1.7846	313.15	0.0032	35	3.7441	1.3202
21.207	3.0543	5.9571	1.7846	313.15	0.0032	35	7.4882	2.0133
37.957	3.6365	5.9571	1.7846	313.15	0.0032	35	14.976	2.7065
68.628	4.2287	5.9571	1.7846	313.15	0.0032	35	29.953	3.3996
124.73	4.8262	5.9571	1.7846	313.15	0.0032	35	59.906	4.0928
68.628	4.2287	5.9571	1.7846	313.15	0.0032	35	119.81	4.7859
37.307	3.6192	5.9571	1.7846	313.15	0.0032	35	239.62	5.4791

sstres	ln stress	40-35-2 k	lnk	T	1/T	C	srate	ln srate
2.0816	0.7331	4.6503	1.5369	313.15	0.0032	35	0.468	-0.759
3.464	1.2424	4.6503	1.5369	313.15	0.0032	35	0.936	-0.066
5.8546	1.7672	4.6503	1.5369	313.15	0.0032	35	1.8721	0.627
10.018	2.3044	4.6503	1.5369	313.15	0.0032	35	3.7441	1.3202
17.873	2.8833	4.6503	1.5369	313.15	0.0032	35	7.4882	2.0133
33.908	3.5236	4.6503	1.5369	313.15	0.0032	35	14.976	2.7065
60.774	4.1072	4.6503	1.5369	313.15	0.0032	35	29.953	3.3996
105.74	4.661	4.6503	1.5369	313.15	0.0032	35	59.906	4.0928
58.058	4.0614	4.6503	1.5369	313.15	0.0032	35	119.81	4.7859
32.005	3.4659	4.6503	1.5369	313.15	0.0032	35	239.62	5.4791

sstres	ln sstress	40-35-3 k	lnk	T	1/T	C	srate	ln srate
2.2117	0.7938	4.9264	1.5946	313.15	0.0032	35	0.468	-0.759
3.6428	1.2928	4.9264	1.5946	313.15	0.0032	35	0.936	-0.066
6.2449	1.8318	4.9264	1.5946	313.15	0.0032	35	1.8721	0.627
10.798	2.3794	4.9264	1.5946	313.15	0.0032	35	3.7441	1.3202
19.157	2.9527	4.9264	1.5946	313.15	0.0032	35	7.4882	2.0133
33.908	3.5236	4.9264	1.5946	313.15	0.0032	35	14.976	2.7065
60.774	4.1072	4.9264	1.5946	313.15	0.0032	35	29.953	3.3996
110.5	4.7051	4.9264	1.5946	313.15	0.0032	35	59.906	4.0928
60.66	4.1053	4.9264	1.5946	313.15	0.0032	35	119.81	4.7859
33.338	3.5067	4.9264	1.5946	313.15	0.0032	35	239.62	5.4791

XII. APPENDIX 6. MEASUREMENTS PERFORMED AT 55°C.

1.- Mixer Viscometry, 0%, 0%, 0 g corn syrup, T = 55°C.

rpm	readings								Average
1	0.1	0	0.1	0.1	0.1	0.1	0	0.1	0.075
2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1125
4	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.1875
8	0.3	0.2	3.3	0.3	0.2	0.3	0.3	0.3	0.2375
16	0.5	0.6	0.5	0.6	0.5	0.5	0.6	0.5	0.5375
32	1	1	1	1	1	1	1	1	1
64	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.125
128	4.7	4.8	4.7	4.7	4.7	4.7	4.7	4.7	4.7125
256	11.7	11.7	11.6	11.7	11.7	11.7	11.7	11.7	11.687
512	33.1	33.1	33.1	33.1	33.1	33.1	33	33	33.075
256	11.6	11.6	11.6	11.6	11.6	11.7	11.6	11.6	11.612
128	4.7	4.7	4.7	4.7	4.7	4.7	4.6	4.7	4.6875
64	2.1	2.1	2.1	2.1	2.1	2.1	2	2.1	2.0875
32	1	1	1	1	1	1	1	1	1
16	0.6	0.5	0.6	0.5	0.5	0.6	0.5	0.6	0.55
8	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2	0.1	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.125
1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.0011	1E-05	-0.98	-4.97
2	0.2094	0.0016	2E-05	-0.679	-4.794
4	0.4188	0.0027	3E-05	-0.378	-4.572
8	0.8376	0.0034	3E-05	-0.077	-4.469
16	1.6752	0.0077	8E-05	0.2241	-4.115
32	3.3504	0.0143	0.0001	0.5251	-3.845
64	6.7008	0.0304	0.0003	0.8261	-3.518
128	13.402	0.0673	0.0007	1.1272	-3.172
256	26.803	0.167	0.0017	1.4282	-2.777
512	53.606	0.4725	0.0047	1.7292	-2.326
256	26.803	0.1659	0.0017	1.4282	-2.78
128	13.402	0.067	0.0007	1.1272	-3.174
64	6.7008	0.0298	0.0003	0.8261	-3.525
32	3.3504	0.0143	0.0001	0.5251	-3.845
16	1.6752	0.0079	8E-05	0.2241	-4.105
8	0.8376	0.0043	4E-05	-0.077	-4.368
4	0.4188	0.0029	3E-05	-0.378	-4.544
2	0.2094	0.0018	2E-05	-0.679	-4.748
1	0.1047	0.0014	1E-05	-0.98	-4.845

Determination of average shear rate
average shear rate = 4.47 angular velocity b = 0.02692 m
average apparent viscosity = shear stress/ shear d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.0976	-0.759	-2.327	0.2085
2	0.2094	0.936	0.1464	-0.066	-1.922	0.1564
4	0.4188	1.872	0.2439	0.627	-1.411	0.1303
8	0.8376	3.7441	0.309	1.3202	-1.174	0.0825
16	1.6752	7.4881	0.6993	2.0133	-0.358	0.0934
32	3.3504	14.976	1.301	2.7065	0.2631	0.0869
64	6.7008	29.953	2.7647	3.3996	1.0169	0.0923
128	13.402	59.905	6.131	4.0928	1.8134	0.1023
256	26.803	119.81	15.206	4.7859	2.7217	0.1269
512	53.606	239.62	43.031	5.4791	3.7619	0.1796
				x	y	

Regression Statistics
R Square 0.9761
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.1295	Interce	-2.044	0.1651	-12.38	6E-07	-2.425	-1.663
n = 0.9672	x1	0.9672	0.0535	18.089	2E-08	0.8439	1.0905

2.- Mixer Viscometry, 0%, g corn syrup, T = 55°C

rpm	readings								Average
1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2	0.1	0.2	0.1	0.1	0.2	0.1	0.2	0.1	0.1375
4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
8	0.4	4.4	0.4	0.4	0.4	0.4	0.4	0.4	0.9
16	0.6	0.7	0.6	0.7	0.6	0.7	0.6	0.6	0.6375
32	1.1	1	1	1.1	1	1	1	1	1.025
64	2	2.1	2	2.1	2.1	2	2	2	2.0375
128	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.7	4.6125
256	11.6	11.6	11.7	11.7	11.7	11.6	11.7	11.7	11.662
512	33.1	33.1	33	33.1	33.1	33	33	33	33.05
256	11.7	11.6	11.7	11.7	11.6	11.7	11.7	11.6	11.662
128	4.7	4.7	4.6	4.7	4.7	4.7	4.6	4.7	4.675
64	2.1	2	2.1	2	2.1	2.1	2	2.1	2.0625
32	1	1	1	1	0.9	1	1	1	0.9875
16	0.5	0.5	0.6	0.5	0.5	0.5	0.6	0.5	0.525
8	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
4		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1125
1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.0014	1E-05	-0.98	-4.845
2	0.2094	0.002	2E-05	-0.679	-4.707
4	0.4188	0.0029	3E-05	-0.378	-4.544
8	0.8376	0.0129	0.0001	-0.077	-3.891
16	1.6752	0.0091	9E-05	0.2241	-4.041
32	3.3504	0.0146	0.0001	0.5251	-3.834
64	6.7008	0.0291	0.0003	0.8261	-3.536
128	13.402	0.0659	0.0007	1.1272	-3.181
256	26.803	0.1666	0.0017	1.4282	-2.778
512	53.606	0.4722	0.0047	1.7292	-2.326
256	26.803	0.1666	0.0017	1.4282	-2.778
128	13.402	0.0668	0.0007	1.1272	-3.175
64	6.7008	0.0295	0.0003	0.8261	-3.531
32	3.3504	0.0141	0.0001	0.5251	-3.851
16	1.6752	0.0075	8E-05	0.2241	-4.125
8	0.8376	0.0043	4E-05	-0.077	-4.368
4	0.4188	0.0029	3E-05	-0.378	-4.544
2	0.2094	0.0016	2E-05	-0.679	-4.794
1	0.1047	0.0014	1E-05	-0.98	-4.845

Determination of average shear rate
average shear rate = 4.47 angular velocity   b = 0.02692 m
average apparent viscosity = shear stress/ shear   d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.1301	-0.759	-2.039	0.278
2	0.2094	0.936	0.1789	-0.066	-1.721	0.1911
4	0.4188	1.872	0.2602	0.627	-1.346	0.139
8	0.8376	3.7441	1.1709	1.3202	0.1578	0.3127
16	1.6752	7.4881	0.8294	2.0133	-0.187	0.1108
32	3.3504	14.976	1.3335	2.7065	0.2878	0.089
64	6.7008	29.953	2.6508	3.3996	0.9749	0.0885
128	13.402	59.905	6.0009	4.0928	1.7919	0.1002
256	26.803	119.81	15.173	4.7859	2.7195	0.1266
512	53.606	239.62	42.999	5.4791	3.7612	0.1794
				x	y	

Regression Statistics
R Square 0.9581
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.1896	Interce	-1.663	0.2033	-8.178	2E-05	-2.132	-1.194
n = 0.891	x1	0.891	0.0659	13.531	3E-07	0.7392	1.0429

3.- Mixer Viscometry, 0%, 65.4 g corn syrup, T = 55°C

rpm	readings								Average
1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2	0.2	0.1	0.2	0.2	0.1	0.1	0.2	0.1	0.15
4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
8	0.3	0.4	0.3	0.4	0.3	0.4	0.3	0.4	0.35
16	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6125
32	1	1	1	1	1	1	1	1	1
64	2.1	2.1	2	2	2.1	2	2.1	2	2.05
128	4.6	4.6	4.7	4.6	4.5	4.6	4.6	4.6	4.6
256	11.5	11.5	11.6	11.5	11.5	11.5	11.5	11.5	11.513
512	32.8	32.8	32.7	32.8	32.8	32.8	32.7	32.8	32.775
256	11.5	11.5	11.6	11.5	11.5	11.5	11.5	11.6	11.525
128	4.6	4.6	4.7	4.6	4.6	4.7	4.6	4.6	4.625
64	2	2.1	2	2.1	2	2.1	2	2	2.0375
32	1	1	1	1	1	1	1	1	1
16	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5125
8	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3125
4	0.2	0.1	0.2	0.2	0.1	0.2	0.1	0.2	0.1625
2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.0014	1E-05	-0.98	-4.845
2	0.2094	0.0021	2E-05	-0.679	-4.669
4	0.4188	0.0029	3E-05	-0.378	-4.544
8	0.8376	0.005	5E-05	-0.077	-4.301
16	1.6752	0.0088	9E-05	0.2241	-4.058
32	3.3504	0.0143	0.0001	0.5251	-3.845
64	6.7008	0.0293	0.0003	0.8261	-3.533
128	13.402	0.0657	0.0007	1.1272	-3.182
256	26.803	0.1645	0.0016	1.4282	-2.784
512	53.606	0.4683	0.0047	1.7292	-2.33
256	26.803	0.1647	0.0016	1.4282	-2.783
128	13.402	0.0661	0.0007	1.1272	-3.18
64	6.7008	0.0291	0.0003	0.8261	-3.536
32	3.3504	0.0143	0.0001	0.5251	-3.845
16	1.6752	0.0073	7E-05	0.2241	-4.135
8	0.8376	0.0045	4E-05	-0.077	-4.35
4	0.4188	0.0023	2E-05	-0.378	-4.634
2	0.2094	0.0014	1E-05	-0.679	-4.845
1	0.1047	0.0014	1E-05	-0.98	-4.845

Determination of average shear rate
average shear rate = 4.47 angular velocity   b = 0.02692 m
average apparent viscosity = shear stress/ shear   d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

	angular velocit	average shear	average shear	Lnshear	Lnshear	Sigma/ Gamma viscos
rpm	rad/s	rate	stress	rate	stress	Pa.s
1	0.1047	0.468	0.1301	-0.759	-2.039	0.278
2	0.2094	0.936	0.1952	-0.066	-1.634	0.2085
4	0.4188	1.872	0.2602	0.627	-1.346	0.139
8	0.8376	3.7441	0.4554	1.3202	-0.787	0.1216
16	1.6752	7.4881	0.7969	2.0133	-0.227	0.1064
32	3.3504	14.976	1.301	2.7065	0.2631	0.0869
64	6.7008	29.953	2.6671	3.3996	0.981	0.089
128	13.402	59.905	5.9847	4.0928	1.7892	0.0999
256	26.803	119.81	14.978	4.7859	2.7066	0.125
512	53.606	239.62	42.641	5.4791	3.7528	0.178
				x	y	

Regression Statistics

R Square	0.9706
Observations	10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.1653	Interce	-1.8	0.1726	-10.43	3E-06	-2.198	-1.402
n = 0.9092	x1	0.9092	0.0559	16.262	6E-08	0.7803	1.0381

4.- Mixer Viscometry, 5%, 4.9685%, 74.67 g corn syrup, Tue, fe, T = 40°C, 3.71 g $CaCO_3$

rpm		readings							Average
1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.5	0.575
4	0.6	0.7	0.7	0.6	0.6	0.6	0.6	0.7	0.6375
8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
16	1	1	1	1	1	1	1	1	1
32	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
64	2.9	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.725
128	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
256	13.8	13.8	13.7	13.7	13.7	13.7	13.7	13.7	13.725
512	38	38	38	38	38	38	38.1	38.1	38.025
256	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7
128	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8
64	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
32	1.4	1.5	1.4	1.5	1.4	1.5	1.5	1.4	1.45
16	0.9	0.9	0.8	0.9	0.8	0.9	0.8	0.9	0.8625
8	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
4	0.5	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.425
2	0.4	0.4	0.4	0.3	0.4	0.3	0.4	0.3	0.3625
1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3

rpm	rad/s omega	(N cm) M	(N m) M	Log Om	Log M
1	0.1047	0.0071	7E-05	-0.98	-4.146
2	0.2094	0.0082	8E-05	-0.679	-4.085
4	0.4188	0.0091	9E-05	-0.378	-4.041
8	0.8376	0.0114	0.0001	-0.077	-3.942
16	1.6752	0.0143	0.0001	0.2241	-3.845
32	3.3504	0.0214	0.0002	0.5251	-3.669
64	6.7008	0.0389	0.0004	0.8261	-3.41
128	13.402	0.0814	0.0008	1.1272	-3.089
256	26.803	0.1961	0.002	1.4282	-2.708
512	53.606	0.5433	0.0054	1.7292	-2.265
256	26.803	0.1957	0.002	1.4282	-2.708
128	13.402	0.0829	0.0008	1.1272	-3.082
64	6.7008	0.0386	0.0004	0.8261	-3.414
32	3.3504	0.0207	0.0002	0.5251	-3.684
16	1.6752	0.0123	0.0001	0.2241	-3.909
8	0.8376	0.0086	9E-05	-0.077	-4.067
4	0.4188	0.0061	6E-05	-0.378	-4.217
2	0.2094	0.0052	5E-05	-0.679	-4.286
1	0.1047	0.0043	4E-05	-0.98	-4.368

Determination of average shear rate
average shear rate = 4.47 angular velocity   b = 0.02692 m
average apparent viscosity = shear stress/ shear   d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.6505	-0.759	-0.43	1.3899
2	0.2094	0.936	0.7481	-0.066	-0.29	0.7992
4	0.4188	1.872	0.8294	0.627	-0.187	0.443
8	0.8376	3.7441	1.0408	1.3202	0.04	0.278
16	1.6752	7.4881	1.301	2.0133	0.2631	0.1737
32	3.3504	14.976	1.9515	2.7065	0.6686	0.1303
64	6.7008	29.953	3.5453	3.3996	1.2656	0.1184
128	13.402	59.905	7.4158	4.0928	2.0036	0.1238
256	26.803	119.81	17.856	4.7859	2.8824	0.149
512	53.606	239.62	49.471	5.4791	3.9014	0.2065
				x	y	

Regression Statistics

R Square	0.8924
Observations	10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.5706	Interce	-0.561	0.2527	-2.221	0.0535	-1.144	0.0215
n = 0.6665	x1	0.6665	0.0818	8.1447	2E-05	0.4778	0.8552

5.- Mixer Viscometry, 5%, 5.0342%, 71.71 g corn syrup, T = 40°C, 3.61 g CaCO3

rpm	readings								Average
1	0.0667	0.0667	0.0667	0.0667	0.0667	0.0667	0.0667	0.0667	0.0667
2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
4	0.1667	0.1667	0.1667	0.1667	0.1667	0.1667	0.1667	0.1667	0.1667
8	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
16	0.6	0.6	0.6	0.6	0.5	0.5	0.6	0.6	0.575
32	1.2	1.1	1.2	1.1	1.2	1.1	1.2	1.1	1.15
64	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
128	5.4	5.3	5.4	5.3	5.4	5.3	5.3	5.3	5.3375
256	13.1	13.2	13.1	13.2	13.1	13.21	13.2	13.1	13.151
512	37.1	37.1	37.2	37.1	37.1	37.2	37.1	37.1	37.125
256	13.1	13.2	13.1	13.2	13.1	13.2	13.1	13.2	13.15
128	5.4	5.4	5.3	5.4	5.4	5.4	5.3	5.4	5.375
64	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
32	1.1	1.1	1.2	1.1	1.2	1.2	1.1	1.2	1.15
16	0.6	0.6	0.5	0.6	0.5	0.6	0.6	0.6	0.575
8	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.2875
4	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.15
2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
1	0.0667	0.0667	0.0667	0.0667	0.0667	0.0667	0.0667	0.0667	0.0667

rpm	omega rad/s	(N cm) M	(N m) M	Log Om	Log M
1	0.1047	0.001	1E-05	-0.98	-5.021
2	0.2094	0.0014	1E-05	-0.679	-4.845
4	0.4188	0.0024	2E-05	-0.378	-4.623
8	0.8376	0.0043	4E-05	-0.077	-4.368
16	1.6752	0.0082	8E-05	0.2241	-4.085
32	3.3504	0.0164	0.0002	0.5251	-3.784
64	6.7008	0.0343	0.0003	0.8261	-3.465
128	13.402	0.0763	0.0008	1.1272	-3.118
256	26.803	0.1879	0.0019	1.4282	-2.726
512	53.606	0.5304	0.0053	1.7292	-2.275
256	26.803	0.1879	0.0019	1.4282	-2.726
128	13.402	0.0768	0.0008	1.1272	-3.115
64	6.7008	0.0343	0.0003	0.8261	-3.465
32	3.3504	0.0164	0.0002	0.5251	-3.784
16	1.6752	0.0082	8E-05	0.2241	-4.085
8	0.8376	0.0041	4E-05	-0.077	-4.386
4	0.4188	0.0021	2E-05	-0.378	-4.669
2	0.2094	0.0014	1E-05	-0.679	-4.845
1	0.1047	0.001	1E-05	-0.98	-5.021

Determination of average shear rate
average shear rate = 4.47 angular velocity　　　b = 0.02692 m
average apparent viscosity = shear stress/ shear　　　d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.0867	-0.759	-2.445	0.1853
2	0.2094	0.936	0.1301	-0.066	-2.039	0.139
4	0.4188	1.872	0.2168	0.627	-1.529	0.1158
8	0.8376	3.7441	0.3903	1.3202	-0.941	0.1042
16	1.6752	7.4881	0.7481	2.0133	-0.29	0.0999
32	3.3504	14.976	1.4962	2.7065	0.4029	0.0999
64	6.7008	29.953	3.1224	3.3996	1.1386	0.1042
128	13.402	59.905	6.9442	4.0928	1.9379	0.1159
256	26.803	119.81	17.11	4.7859	2.8397	0.1428
512	53.606	239.62	48.3	5.4791	3.8774	0.2016
				x	y	

Regression Statistics
R Square 0.9857
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.1244	Interce	-2.084	0.1327	-15.71	8E-08	-2.39	-1.778
n = 1.0083	x1	1.0083	0.043	23.468	2E-09	0.9092	1.1074

6.- Mixer Viscometry, 5%, 4.9701%, 61.77 g corn syrup, T = 40°C, 3.07 g CaCO3

rpm	readings								Average
1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
4	0.2	0.3	0.3	0.2	0.3	0.3	0.2	0.3	0.2625
8	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4125
16	0.7	0.7	0.8	0.7	0.8	0.8	0.7	0.8	0.75
32	1.3	1.3	1.2	1.3	1.2	1.3	1.2	1.3	1.2625
64	2.6	22.6	2.6	2.5	2.6	2.5	2.6	2.6	5.075
128	5.7	5.6	5.7	5.6	5.7	5.7	5.6	5.6	5.65
256	13.5	13.5	13.5	13.4	13.5	13.5	13.5	13.5	13.488
512	37.8	37.9	37.8	37.9	38	37.9	37.9	38	37.9
256	13.5	13.6	13.5	13.5	13.5	13.6	13.6	13.6	13.55
128	5.6	5.7	5.7	5.6	5.7	5.6	5.7	5.6	5.65
64	2.6	2.5	2.5	2.5	2.6	2.5	2.5	2.6	2.5375
32	1.3	1.2	1.3	1.2	1.2	1.2	1.2	1.2	1.225
16	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
8	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.3	0.275
4	0.1	0.1	0.1333	0.1333	0.1333	0.1333	0.1667	0.1333	0.1292
2	0.0333	0.0667	0.0333	0.0667	0.0667	0.0667	0.0667	0.0667	0.0583
1	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.0014	1E-05	-0.98	-4.845
2	0.2094	0.0029	3E-05	-0.679	-4.544
4	0.4188	0.0038	4E-05	-0.378	-4.426
8	0.8376	0.0059	6E-05	-0.077	-4.23
16	1.6752	0.0107	0.0001	0.2241	-3.97
32	3.3504	0.018	0.0002	0.5251	-3.744
64	6.7008	0.0725	0.0007	0.8261	-3.14
128	13.402	0.0807	0.0008	1.1272	-3.093
256	26.803	0.1927	0.0019	1.4282	-2.715
512	53.606	0.5415	0.0054	1.7292	-2.266
256	26.803	0.1936	0.0019	1.4282	-2.713
128	13.402	0.0807	0.0008	1.1272	-3.093
64	6.7008	0.0363	0.0004	0.8261	-3.441
32	3.3504	0.0175	0.0002	0.5251	-3.757
16	1.6752	0.0086	9E-05	0.2241	-4.067
8	0.8376	0.0039	4E-05	-0.077	-4.406
4	0.4188	0.0018	2E-05	-0.378	-4.734
2	0.2094	0.0008	8E-06	-0.679	-5.079
1	0.1047	0.0005	5E-06	-0.98	-5.322

Determination of average shear rate
average shear rate = 4.47 angular velocity   b = 0.02692 m
average apparent viscosity = shear stress/ shear   d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

	angular velocit	average shear	average shear	Lnshear	Lnshear	Sigma/ Gamma viscos
rpm	rad/s	rate	stress	rate	stress	Pa.s
1	0.1047	0.468	0.1301	-0.759	-2.039	0.278
2	0.2094	0.936	0.2602	-0.066	-1.346	0.278
4	0.4188	1.872	0.3415	0.627	-1.074	0.1824
8	0.8376	3.7441	0.5367	1.3202	-0.622	0.1433
16	1.6752	7.4881	0.9758	2.0133	-0.025	0.1303
32	3.3504	14.976	1.6425	2.7065	0.4962	0.1097
64	6.7008	29.953	6.6026	3.3996	1.8875	0.2204
128	13.402	59.905	7.3507	4.0928	1.9948	0.1227
256	26.803	119.81	17.547	4.7859	2.8649	0.1465
512	53.606	239.62	49.308	5.4791	3.8981	0.2058
				x	y	

Regression Statistics

R Square	0.9768
Observations	10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.2039	Interce	-1.59	0.1564	-10.17	3E-06	-1.951	-1.229
n = 0.9296	x1	0.9296	0.0507	18.348	2E-08	0.8127	1.0464

Checking the values of 5%...

rpm	readings								Average
1	0.1667	0.1667	0.1667	0.2	0.2	0.1667	0.1667	0.1667	0.175
2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
4	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.25
8	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
16	0.6	0.7	0.6	0.7	0.6	0.7	0.6	0.6	0.6375
32	1.1	1.2	1.1	1.2	1.1	1.2	1.1	1.2	1.15
64	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
128	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
256	13.4	13.4	13.5	13.3	13.4	13.4	13.4	13.4	13.4
512	38	38	38	38	38	38	38	38	38
256	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5
128	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
64	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
32	1.2	1.1	1.2	1.1	1.1	1.1	1.2	1.1	1.1375
16	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.6	0.525
8	0.3	0.2	0.3	0.2	0.2	0.3	0.2	0.3	0.25
4	0.1333	0.1333	0.1333	0.1333	0.1333	0.1467	0.1333	0.1333	0.135
2	0.0667	0.0667	0.0667	0.0667	0.0667	0.0667	0.0667	0.0667	0.0667
1	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.0025	3E-05	-0.98	-4.602
2	0.2094	0.0029	3E-05	-0.679	-4.544
4	0.4188	0.0036	4E-05	-0.378	-4.447
8	0.8376	0.0057	6E-05	-0.077	-4.243
16	1.6752	0.0091	9E-05	0.2241	-4.041
32	3.3504	0.0164	0.0002	0.5251	-3.784
64	6.7008	0.0343	0.0003	0.8261	-3.465
128	13.402	0.0786	0.0008	1.1272	-3.105
256	26.803	0.1914	0.0019	1.4282	-2.718
512	53.606	0.5429	0.0054	1.7292	-2.265
256	26.803	0.1929	0.0019	1.4282	-2.715
128	13.402	0.0786	0.0008	1.1272	-3.105
64	6.7008	0.0343	0.0003	0.8261	-3.465
32	3.3504	0.0163	0.0002	0.5251	-3.789
16	1.6752	0.0075	8E-05	0.2241	-4.125
8	0.8376	0.0036	4E-05	-0.077	-4.447
4	0.4188	0.0019	2E-05	-0.378	-4.715
2	0.2094	0.001	1E-05	-0.679	-5.021
1	0.1047	0.0005	5E-06	-0.98	-5.322

Determination of average shear rate
average shear rate = 4.47 angular velocity b = 0.02692 m
average apparent viscosity = shear stress/ shear d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.2277	-0.759	-1.48	0.4865
2	0.2094	0.936	0.2602	-0.066	-1.346	0.278
4	0.4188	1.872	0.3253	0.627	-1.123	0.1737
8	0.8376	3.7441	0.5204	1.3202	-0.653	0.139
16	1.6752	7.4881	0.8294	2.0133	-0.187	0.1108
32	3.3504	14.976	1.4962	2.7065	0.4029	0.0999
64	6.7008	29.953	3.1224	3.3996	1.1386	0.1042
128	13.402	59.905	7.1556	4.0928	1.9679	0.1194
256	26.803	119.81	17.434	4.7859	2.8584	0.1455
512	53.606	239.62	49.439	5.4791	3.9007	0.2063
				x	y	

Regression Statistics
R Square 0.9499
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.223	Interce	-1.501	0.2175	-6.899	7E-05	-2.002	-0.999
n = 0.8681	x1	0.8681	0.0704	12.322	6E-07	0.7056	1.0305

7.- Mixer Viscometry, 15%, 15.005%, 70.31 g corn syrup, T = 40.8°C, 10.55 g CaCO3

rpm		readings							Average
1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2	0.15
4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
8	0.5	0.5	0.6	0.6	0.5	0.5	0.5	0.6	0.5375
16	1	1	1	0.9	0.9	1	1	1	0.975
32	1.9	1.8	1.8	1.9	1.8	1.8	1.8	1.8	1.825
64	3.8	3.7	3.7	3.7	3.7	3.7	3.8	3.7	3.725
128	7.9	8	7.8	7.8	7.9	7.8	7.9	7.8	7.8625
256	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
512	49	48.9	49	48.9	49	48.9	49	48.9	48.95
256	18.1	18.2	18.2	18.1	18.2	18.1	18.1	18.1	18.138
128	7.9	7.8	7.9	7.9	7.9	7.9	7.9	7.9	7.8875
64	3.7	3.7	3.6	3.7	3.7	3.7	3.7	3.7	3.6875
32	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
16	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
8	0.5	0.4	0.5	0.4	0.5	0.4	0.5	0.4	0.45
4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
1	0.0667	0.0667	0.0667	0.1	0.1	0.1	0.0667	0.1	0.0833

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.0014	1E-05	-0.98	-4.845
2	0.2094	0.0021	2E-05	-0.679	-4.669
4	0.4188	0.0043	4E-05	-0.378	-4.368
8	0.8376	0.0077	8E-05	-0.077	-4.115
16	1.6752	0.0139	0.0001	0.2241	-3.856
32	3.3504	0.0261	0.0003	0.5251	-3.584
64	6.7008	0.0532	0.0005	0.8261	-3.274
128	13.402	0.1123	0.0011	1.1272	-2.949
256	26.803	0.2586	0.0026	1.4282	-2.587
512	53.606	0.6994	0.007	1.7292	-2.155
256	26.803	0.2591	0.0026	1.4282	-2.586
128	13.402	0.1127	0.0011	1.1272	-2.948
64	6.7008	0.0527	0.0005	0.8261	-3.278
32	3.3504	0.0257	0.0003	0.5251	-3.59
16	1.6752	0.0129	0.0001	0.2241	-3.891
8	0.8376	0.0064	6E-05	-0.077	-4.192
4	0.4188	0.0029	3E-05	-0.378	-4.544
2	0.2094	0.0014	1E-05	-0.679	-4.845
1	0.1047	0.0012	1E-05	-0.98	-4.924

Determination of average shear rate
average shear rate = 4.47 angular velocity b = 0.026 92 m
average apparent viscosity = shear stress/ shear d = 0.041 43 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.1301	-0.759	-2.039	0.278
2	0.2094	0.936	0.1952	-0.066	-1.634	0.2085
4	0.4188	1.872	0.3903	0.627	-0.941	0.2085
8	0.8376	3.7441	0.6993	1.3202	-0.358	0.1868
16	1.6752	7.4881	1.2685	2.0133	0.2378	0.1694
32	3.3504	14.976	2.3744	2.7065	0.8647	0.1585
64	6.7008	29.953	4.8463	3.3996	1.5782	0.1618
128	13.402	59.905	10.229	4.0928	2.3252	0.1708
256	26.803	119.81	23.548	4.7859	3.1591	0.1965
512	53.606	239.62	63.685	5.4791	4.1539	0.2658
				x	y	

Regression Statistics
R Square 0.9914
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.2065	Interce	-1.577	0.0997	-15.83	7E-08	-1.807	-1.348
n = 0.9798	x1	0.9798	0.0323	30.35	2E-10	0.9053	1.0542

8.- Mixer Viscometry, 15%, 15.02%, 71.53 g corn syrup, T= 40°C, 10.75 g CaCO3

rpm	readings								Average
1	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.2	0.1625
2	0.2667	0.2667	0.2667	0.2333	0.2667	0.2667	0.2667	0.3	0.2667
4	0.3667	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3958
8	0.6333	0.6333	0.6333	0.6333	0.6333	0.6333	0.6333	0.6333	0.6333
16	0.9667	0.9333	0.9667	0.9667	0.9667	0.9667	0.9667	0.9667	0.9625
32	1.8333	1.8333	1.8333	1.8333	1.8333	1.8333	1.8333	1.8333	1.8333
64	3.7333	3.7667	3.7333	3.7333	3.7	3.7333	3.7	3.7	3.725
128	7.9333	7.9667	7.9333	7.9333	7.9333	7.9333	7.9333	7.9333	7.9375
256	18.4	18.433	18.433	18.433	18.467	18.467	18.5	18.5	18.454
512	49.9	50.1	50.2	50.1	50.1	50.1	50.2	50.1	50.1
256	18.7	18.6	18.6	18.6	18.6	18.7	18.6	18.7	18.638
128	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1
64	3.7	3.7	3.7	3.7	3.7	3.8	3.7	3.8	3.725
32	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
16	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
8	0.4667	0.4333	0.4333	0.4333	0.4333	0.4333	0.4333	0.4333	0.4375
4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2	0.1	0.0667	0.1	0.0667	0.0667	0.0667	0.0667	0.1	0.0792
1	0.033	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.0023	2E-05	-0.98	-4.634
2	0.2094	0.0038	4E-05	-0.679	-4.419
4	0.4188	0.0057	6E-05	-0.378	-4.248
8	0.8376	0.009	9E-05	-0.077	-4.043
16	1.6752	0.0138	0.0001	0.2241	-3.862
32	3.3504	0.0262	0.0003	0.5251	-3.582
64	6.7008	0.0532	0.0005	0.8261	-3.274
128	13.402	0.1134	0.0011	1.1272	-2.945
256	26.803	0.2637	0.0026	1.4282	-2.579
512	53.606	0.7158	0.0072	1.7292	-2.145
256	26.803	0.2663	0.0027	1.4282	-2.575
128	13.402	0.1157	0.0012	1.1272	-2.937
64	6.7008	0.0532	0.0005	0.8261	-3.274
32	3.3504	0.0257	0.0003	0.5251	-3.59
16	1.6752	0.0129	0.0001	0.2241	-3.891
8	0.8376	0.0063	6E-05	-0.077	-4.204
4	0.4188	0.0029	3E-05	-0.378	-4.544
2	0.2094	0.0011	1E-05	-0.679	-4.947
1	0.1047	0.0005	5E-06	-0.98	-5.322

Determination of average shear rate
average shear rate = 4.47 angular velocity b = 0.02692 m
average apparent viscosity = shear stress/ shear d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

	angular velocit	average shear	average shear	Lnshear	Lnshear	Sigma/ Gamma viscos
rpm	rad/s	rate	stress	rate	stress	Pa.s
1	0.1047	0.468	0.2114	-0.759	-1.554	0.4517
2	0.2094	0.936	0.3469	-0.066	-1.059	0.3707
4	0.4188	1.872	0.515	0.627	-0.664	0.2751
8	0.8376	3.7441	0.824	1.3202	-0.194	0.2201
16	1.6752	7.4881	1.2522	2.0133	0.2249	0.1672
32	3.3504	14.976	2.3852	2.7065	0.8693	0.1593
64	6.7008	29.953	4.8463	3.3996	1.5782	0.1618
128	13.402	59.905	10.327	4.0928	2.3347	0.1724
256	26.803	119.81	24.009	4.7859	3.1784	0.2004
512	53.606	239.62	65.181	5.4791	4.1772	0.272
				x	y	

Regression Statistics
R Square 0.9766
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.2954	Interce	-1.219	0.151	-8.074	2E-05	-1.568	-0.871
n = 0.8935	x1	0.8935	0.0489	18.269	2E-08	0.7807	1.0063

9.- Mixer Viscometry, 15%, 14.99%, 60.7 g corn syrup, T = 40.2°C, 9.1 g CaCO3

rpm	readings								Average
1	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333
2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
4	0.2667	0.2667	0.2667	0.2667	0.2333	0.2667	0.2667	0.2667	0.2625
8	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
16	1	1	1	1	1	1	1	1	1
32	2	2	2	2	1.9	1.9	2	1.9	1.9625
64	4	4	4	4	4	4	4	4	4
128	8.4	8.4	8.4	8.4	8.4	8.5	8.4	8.4	8.4125
256	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
512	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8
256	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
128	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
64	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
32	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
16	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
8	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2	0.0667	0.0667	0.0667	0.0667	0.0667	0.0667	0.1	0.1	0.075
1	0.0333	0.0333	0	0.0333	0.0333	0.0333	0.0333	0	0.025

rpm	rad/s omega	(N cm) M	(N m) M	Log Om	Log M
1	0.1047	0.0005	5E-06	-0.98	-5.322
2	0.2094	0.0014	1E-05	-0.679	-4.845
4	0.4188	0.0038	4E-05	-0.378	-4.426
8	0.8376	0.0071	7E-05	-0.077	-4.146
16	1.6752	0.0143	0.0001	0.2241	-3.845
32	3.3504	0.028	0.0003	0.5251	-3.552
64	6.7008	0.0571	0.0006	0.8261	-3.243
128	13.402	0.1202	0.0012	1.1272	-2.92
256	26.803	0.2743	0.0027	1.4282	-2.562
512	53.606	0.7258	0.0073	1.7292	-2.139
256	26.803	0.2743	0.0027	1.4282	-2.562
128	13.402	0.12	0.0012	1.1272	-2.921
64	6.7008	0.0557	0.0006	0.8261	-3.254
32	3.3504	0.0271	0.0003	0.5251	-3.566
16	1.6752	0.0129	0.0001	0.2241	-3.891
8	0.8376	0.0057	6E-05	-0.077	-4.243
4	0.4188	0.0029	3E-05	-0.378	-4.544
2	0.2094	0.0011	1E-05	-0.679	-4.97
1	0.1047	0.0004	4E-06	-0.98	-5.447

Determination of average shear rate
average shear rate = 4.47 angular velocity   b = 0.02692 m
average apparent viscosity = shear stress/ shear   d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.0434	-0.759	-3.138	0.0927
2	0.2094	0.936	0.1301	-0.066	-2.039	0.139
4	0.4188	1.872	0.3415	0.627	-1.074	0.1824
8	0.8376	3.7441	0.6505	1.3202	-0.43	0.1737
16	1.6752	7.4881	1.301	2.0133	0.2631	0.1737
32	3.3504	14.976	2.5532	2.7065	0.9374	0.1705
64	6.7008	29.953	5.2041	3.3996	1.6494	0.1737
128	13.402	59.905	10.945	4.0928	2.3929	0.1827
256	26.803	119.81	24.979	4.7859	3.2181	0.2085
512	53.606	239.62	66.092	5.4791	4.191	0.2758
				x	y	

Regression Statistics
R Square 0.9957
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.1322	Interce	-2.024	0.0796	-25.41	1E-09	-2.207	-1.84
n = 1.1106	x1	1.1106	0.0258	43.053	1E-11	1.0511	1.17

10.- Mixer Viscometry, 25%, 24.94%, 70.29 g corn syrup, T= 40.8°C, 17.53 g CaCO3

rpm	readings								Average
1	0.1667	0.1667	0.1667	0.1667	0.1667	0.1667	0.1667	0.1667	0.1667
2	0.3	0.3333	0.3	0.3	0.3	0.3	0.3	0.3333	0.3083
4	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
8	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
16	2.1	2.1	2.1	2.1	2.1	2.1	2	2.1	2.0875
32	4	4	4	4	4	4	4	4	4
64	7.9	7.9	7.9	7.9	7.8	7.9	7.9	7.9	7.8875
128	16	16	16	16	16.1	16	16	16	16.013
256	32.8	32.8	32.8	32.7	32.6	32.6	32.6	32.6	32.688
512	70.7	70.7	70.7	70.6	70.6	70.5	70.5	70.5	70.6
256	31.1	31.1	31.2	31.2	31.2	31.2	31.2	31.2	31.175
128	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.3	15.213
64	7.7	7.7	7.7	7.6	7.6	7.7	7.7	7.7	7.675
32	4	3.9	3.9	3.994	3.9	4	3.9	4	3.9493
16	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
2	0.1	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.1375
1	0.0333	0.0667	0.0333	0.0667	0.0333	0.0333	0.0333	0.0667	0.0458

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.0024	2E-05	-0.98	-4.623
2	0.2094	0.0044	4E-05	-0.679	-4.356
4	0.4188	0.0086	9E-05	-0.378	-4.067
8	0.8376	0.0157	0.0002	-0.077	-3.804
16	1.6752	0.0298	0.0003	0.2241	-3.525
32	3.3504	0.0571	0.0006	0.5251	-3.243
64	6.7008	0.1127	0.0011	0.8261	-2.948
128	13.402	0.2288	0.0023	1.1272	-2.641
256	26.803	0.467	0.0047	1.4282	-2.331
512	53.606	1.0087	0.0101	1.7292	-1.996
256	26.803	0.4454	0.0045	1.4282	-2.351
128	13.402	0.2173	0.0022	1.1272	-2.663
64	6.7008	0.1097	0.0011	0.8261	-2.96
32	3.3504	0.0564	0.0006	0.5251	-3.249
16	1.6752	0.0271	0.0003	0.2241	-3.566
8	0.8376	0.0129	0.0001	-0.077	-3.891
4	0.4188	0.0057	6E-05	-0.378	-4.243
2	0.2094	0.002	2E-05	-0.679	-4.707
1	0.1047	0.0007	7E-06	-0.98	-5.184

Determination of average shear rate
average shear rate = 4.47 angular velocity   b = 0.02692 m
average apparent viscosity = shear stress/ shear   d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

	angular velocit	average shear	average shear	Lnshear	Lnshear	Sigma/ Gamma viscos
rpm	rad/s	rate	stress	rate	stress	Pa.s
1	0.1047	0.468	0.2169	-0.759	-1.528	0.4634
2	0.2094	0.936	0.4011	-0.066	-0.913	0.4286
4	0.4188	1.872	0.7806	0.627	-0.248	0.417
8	0.8376	3.7441	1.4311	1.3202	0.3585	0.3822
16	1.6752	7.4881	2.7159	2.0133	0.9991	0.3627
32	3.3504	14.976	5.2041	2.7065	1.6494	0.3475
64	6.7008	29.953	10.262	3.3996	2.3284	0.3426
128	13.402	59.905	20.832	4.0928	3.0365	0.3478
256	26.803	119.81	42.527	4.7859	3.7501	0.355
512	53.606	239.62	91.852	5.4791	4.5202	0.3833
				x	y	

Regression Statistics
R Square 0.9989
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.4165	Interce	-0.876	0.0346	-25.34	1E-09	-0.955	-0.796
n = 0.9624	x1	0.9624	0.0112	85.977	2E-14	0.9365	0.9882

11.- Mixer Viscometry, 25%, 25.01%, 71.54, g corn syrup, T = 40°C, 17.89 g CaCO3

rpm	readings								Average
1	0.0667	0.0667	0.1	0.0667	0.0667	0.0667	0.0667	0.0667	0.0708
2	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333	0.0333
4	0.2667	0.2667	0.2667	0.2667	0.2667	0.2667	0.2667	0.2667	0.2667
8	0.7	0.8	0.7	0.7	0.8	0.7	0.7	0.7	0.725
16	1.7	1.6	1.6	1.7	1.6	1.7	1.6	1.7	1.65
32	3.6	3.5	3.6	3.5	3.6	3.5	3.6	3.5	3.55
64	7.1	7.1	7.2	7.1	7.2	7.1	7.2	7.1	7.1375
128	14.7	14.6	14.6	1.5	14.5	14.5	14.6	14.5	12.938
256	30.5	30.5	30.5	30.5	30.5	30.4	30.3	30.4	30.45
512	69	69.1	69	69	69	69	69	69.1	69.025
256	29.6	29.6	29.7	29.6	29.7	29.6	29.6	29.7	29.638
128	14.1	14.2	14.1	14.2	14.2	14.1	14.1	14.2	14.15
64	7	6.9	6.9	7	7.1	7	7	7	6.9875
32	3.5	3.5	3.5	3.6	3.5	3.5	3.6	3.5	3.525
16	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
4	0.3333	0.3333	0.3667	0.3	0.3333	0.3667	0.3667	0.3667	0.3458
2	0.1	0.1	0.1	0.1	0.1	0.0667	0.1	0.1	0.0958
1	0.0333	0	0.0333	0	0	0	0	0	0.0083

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.001	1E-05	-0.98	-4.995
2	0.2094	0.0005	5E-06	-0.679	-5.322
4	0.4188	0.0038	4E-05	-0.378	-4.419
8	0.8376	0.0104	0.0001	-0.077	-3.985
16	1.6752	0.0236	0.0002	0.2241	-3.628
32	3.3504	0.0507	0.0005	0.5251	-3.295
64	6.7008	0.102	0.001	0.8261	-2.992
128	13.402	0.1848	0.0018	1.1272	-2.733
256	26.803	0.435	0.0044	1.4282	-2.361
512	53.606	0.9862	0.0099	1.7292	-2.006
256	26.803	0.4234	0.0042	1.4282	-2.373
128	13.402	0.2022	0.002	1.1272	-2.694
64	6.7008	0.0998	0.001	0.8261	-3.001
32	3.3504	0.0504	0.0005	0.5251	-3.298
16	1.6752	0.0243	0.0002	0.2241	-3.615
8	0.8376	0.0114	0.0001	-0.077	-3.942
4	0.4188	0.0049	5E-05	-0.378	-4.306
2	0.2094	0.0014	1E-05	-0.679	-4.864
1	0.1047	0.0001	1E-06	-0.98	-5.924

Determination of average shear rate
average shear rate = 4.47 angular velocity   b = 0.02692 m
average apparent viscosity = shear stress/ shear   d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

	angular	average	average			Sigma/ Gamma
	velocit	shear	shear	Lnshear	Lnshear	viscos
rpm	rad/s	rate	stress	rate	stress	Pa.s
1	0.1047	0.468	0.0922	-0.759	-2.384	0.1969
2	0.2094	0.936	0.0434	-0.066	-3.138	0.0463
4	0.4188	1.872	0.3469	0.627	-1.059	0.1853
8	0.8376	3.7441	0.9432	1.3202	-0.058	0.2519
16	1.6752	7.4881	2.1467	2.0133	0.7639	0.2867
32	3.3504	14.976	4.6186	2.7065	1.5301	0.3084
64	6.7008	29.953	9.286	3.3996	2.2285	0.31
128	13.402	59.905	16.832	4.0928	2.8233	0.281
256	26.803	119.81	39.616	4.7859	3.6792	0.3307
512	53.606	239.62	89.803	5.4791	4.4976	0.3748
				x	y	

Regression Statistics
R Square 0.9697
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.1448	Interce	-1.932	0.2307	-8.377	2E-05	-2.464	-1.4
n = 1.1952	x1	1.1952	0.0747	15.998	6E-08	1.0229	1.3675

12.- Mixer Viscometry, 25%, 0.25%, 70.88 g corn syrup 17.72, 22.1 g CaCO3

rpm		readings							Average
1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.25
4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
8	1	1	1	1	1	1	1	1	1
16	1.9	1.9	1.9	1.9	1.9	1.8	1.9	1.9	1.8875
32	3.6	3.6	3.5	3.5	3.5	3.5	3.5	3.6	3.5375
64	7	7	7	7	7.1	7	7.1	7	7.025
128	14.3	14.3	14.3	14.3	14.4	14.4	14.3	14.3	14.325
256	29.7	29.7	29.7	29.6	29.7	29.7	29.6	29.5	29.65
512	66.2	66.3	66.3	66.3	66.3	66.3	66.4	66.4	66.313
256	28.5	28.5	28.5	28.6	28.5	28.5	28.5	28.5	28.513
128	13.7	13.6	13.7	13.6	13.7	13.6	13.7	13.6	13.65
64	6.9	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8125
32	3.5	3.5	3.5	3.5	3.4	3.5	3.5	3.5	3.4875
16	1.7	1.7	1.7	1.7	1.7	1.8	1.7	1.7	1.7125
8	0.8	0.9	0.9	0.9	0.8	0.9	0.8	0.9	0.8625
4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.1875
1	0.1	0.1	0.1	0.6667	0.1	0.1	0.6667	0.1	0.2417

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.0014	1E-05	-0.98	-4.845
2	0.2094	0.0036	4E-05	-0.679	-4.447
4	0.4188	0.0071	7E-05	-0.378	-4.146
8	0.8376	0.0143	0.0001	-0.077	-3.845
16	1.6752	0.027	0.0003	0.2241	-3.569
32	3.3504	0.0505	0.0005	0.5251	-3.296
64	6.7008	0.1004	0.001	0.8261	-2.998
128	13.402	0.2047	0.002	1.1272	-2.689
256	26.803	0.4236	0.0042	1.4282	-2.373
512	53.606	0.9474	0.0095	1.7292	-2.023
256	26.803	0.4074	0.0041	1.4282	-2.39
128	13.402	0.195	0.002	1.1272	-2.71
64	6.7008	0.0973	0.001	0.8261	-3.012
32	3.3504	0.0498	0.0005	0.5251	-3.303
16	1.6752	0.0245	0.0002	0.2241	-3.611
8	0.8376	0.0123	0.0001	-0.077	-3.909
4	0.4188	0.0057	6E-05	-0.378	-4.243
2	0.2094	0.0027	3E-05	-0.679	-4.572
1	0.1047	0.0035	3E-05	-0.98	-4.462

Determination of average shear rate
average shear rate = 4.47 angular velocity b = 0.02692 m
average apparent viscosity = shear stress/ shear d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.1301	-0.759	-2.039	0.278
2	0.2094	0.936	0.3253	-0.066	-1.123	0.3475
4	0.4188	1.872	0.6505	0.627	-0.43	0.3475
8	0.8376	3.7441	1.301	1.3202	0.2631	0.3475
16	1.6752	7.4881	2.4557	2.0133	0.8984	0.3279
32	3.3504	14.976	4.6023	2.7065	1.5266	0.3073
64	6.7008	29.953	9.1396	3.3996	2.2126	0.3051
128	13.402	59.905	18.637	4.0928	2.9252	0.3111
256	26.803	119.81	38.575	4.7859	3.6526	0.322
512	53.606	239.62	86.274	5.4791	4.4575	0.36
				x	y	

Regression Statistics

R Square	0.9986
Observations	10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.3193	Interce	-1.142	0.0409	-27.92	5E-10	-1.236	-1.047
n = 1.0069	x1	1.0069	0.0132	76.03	6E-14	0.9763	1.0374

12 a.- Mixer Viscometry, 25%, 0.25%, 70.52 g corn syrup, 55°C, 17.63, 22.1 g CaCO3

rpm	readings								Average
1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
2	0.4	0.5	0.4	0.5	0.4	0.5	0.5	0.5	0.4625
4	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
8	1.1	1.2	1.2	1.1	1.2	1.1	1.2	1.1	1.15
16	2	2	2	2	2	2	2	2	2
32	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
64	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
128	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8
256	30.6	30.6	30.6	30.6	30.7	30.7	30.7	30.7	30.65
512	68	67.8	67.8	67.8	67.8	67.8	67.8	67.8	67.825
256	29.9	29.9	29.9	29.9	29.9	29.8	29.8	29.9	29.875
128	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
64	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
32	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
16	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
8	1.1	1.1	1.1	1.2	1.1	1.2	1.1	1.2	1.1375
4	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3

rpm	rad/s omega	(N cm) M	(N m) M	Log Om	Log M
1	0.1047	0.0043	4E-05	-0.98	-4.368
2	0.2094	0.0066	7E-05	-0.679	-4.18
4	0.4188	0.01	0.0001	-0.378	-4
8	0.8376	0.0164	0.0002	-0.077	-3.784
16	1.6752	0.0286	0.0003	0.2241	-3.544
32	3.3504	0.0543	0.0005	0.5251	-3.265
64	6.7008	0.1057	0.0011	0.8261	-2.976
128	13.402	0.2115	0.0021	1.1272	-2.675
256	26.803	0.4379	0.0044	1.4282	-2.359
512	53.606	0.969	0.0097	1.7292	-2.014
256	26.803	0.4268	0.0043	1.4282	-2.37
128	13.402	0.2072	0.0021	1.1272	-2.684
64	6.7008	0.1057	0.0011	0.8261	-2.976
32	3.3504	0.0557	0.0006	0.5251	-3.254
16	1.6752	0.03	0.0003	0.2241	-3.523
8	0.8376	0.0163	0.0002	-0.077	-3.789
4	0.4188	0.01	0.0001	-0.378	-4
2	0.2094	0.0057	6E-05	-0.679	-4.243
1	0.1047	0.0043	4E-05	-0.98	-4.368

Determination of average shear rate
average shear rate = 4.47 angular velocity   b = 0.02692 m
average apparent viscosity = shear stress/ shear   d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.3903	-0.759	-0.941	0.834
2	0.2094	0.936	0.6017	-0.066	-0.508	0.6428
4	0.4188	1.872	0.9107	0.627	-0.094	0.4865
8	0.8376	3.7441	1.4962	1.3202	0.4029	0.3996
16	1.6752	7.4881	2.602	2.0133	0.9563	0.3475
32	3.3504	14.976	4.9439	2.7065	1.5981	0.3301
64	6.7008	29.953	9.6275	3.3996	2.2646	0.3214
128	13.402	59.905	19.255	4.0928	2.9578	0.3214
256	26.803	119.81	39.876	4.7859	3.6858	0.3328
512	53.606	239.62	88.241	5.4791	4.4801	0.3683
				x	y	

Regression Statistics
R Square 0.9893
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.5625	Interce	-0.575	0.0987	-5.828	0.0003	-0.803	-0.348
n = 0.8711	x1	0.8711	0.032	27.243	6E-10	0.7974	0.9448

12 b.- Mixer Viscometry, 25%, 0.25%, 71.39 g corn syrup, 55°C, 17.85, 22.1 g CaCO3

rpm	readings								Average
1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2875
2	0.4	0.5	0.4	0.5	0.4	0.5	0.5	0.5	0.4625
4	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
8	1.1	1.2	1.2	1.1	1.2	1.1	1.2	1.1	1.15
16	2	2	2	2	2	2	2	2	2
32	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
64	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
128	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8
256	30.6	30.6	30.6	30.6	30.7	30.7	30.7	30.7	30.65
512	68	67.8	67.8	67.8	67.8	67.8	67.8	67.8	67.825
256	29.9	29.9	29.9	29.9	29.9	29.8	29.8	29.9	29.875
128	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
64	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
32	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
16	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
8	1.1	1.1	1.1	1.2	1.1	1.2	1.1	1.2	1.1375
4	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3

rpm	rad/s omega	(N cm) M	(N m) M	Log Om	Log M
1	0.1047	0.0041	4E-05	-0.98	-4.386
2	0.2094	0.0066	7E-05	-0.679	-4.18
4	0.4188	0.01	0.0001	-0.378	-4
8	0.8376	0.0164	0.0002	-0.077	-3.784
16	1.6752	0.0286	0.0003	0.2241	-3.544
32	3.3504	0.0543	0.0005	0.5251	-3.265
64	6.7008	0.1057	0.0011	0.8261	-2.976
128	13.402	0.2115	0.0021	1.1272	-2.675
256	26.803	0.4379	0.0044	1.4282	-2.359
512	53.606	0.969	0.0097	1.7292	-2.014
256	26.803	0.4268	0.0043	1.4282	-2.37
128	13.402	0.2072	0.0021	1.1272	-2.684
64	6.7008	0.1057	0.0011	0.8261	-2.976
32	3.3504	0.0557	0.0006	0.5251	-3.254
16	1.6752	0.03	0.0003	0.2241	-3.523
8	0.8376	0.0163	0.0002	-0.077	-3.789
4	0.4188	0.01	0.0001	-0.378	-4
2	0.2094	0.0057	6E-05	-0.679	-4.243
1	0.1047	0.0043	4E-05	-0.98	-4.368

Determination of average shear rate
average shear rate = 4.47 angular velocity   b = 0.02692 m
average apparent viscosity = shear stress/ shear   d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.374	-0.759	-0.983	0.7992
2	0.2094	0.936	0.6017	-0.066	-0.508	0.6428
4	0.4188	1.872	0.9107	0.627	-0.094	0.4865
8	0.8376	3.7441	1.4962	1.3202	0.4029	0.3996
16	1.6752	7.4881	2.602	2.0133	0.9563	0.3475
32	3.3504	14.976	4.9439	2.7065	1.5981	0.3301
64	6.7008	29.953	9.6275	3.3996	2.2646	0.3214
128	13.402	59.905	19.255	4.0928	2.9578	0.3214
256	26.803	119.81	39.876	4.7859	3.6858	0.3328
512	53.606	239.62	88.241	5.4791	4.4801	0.3683
				x	y	

Regression Statistics

R Square	0.9902
Observations	10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.5557	Interce	-0.588	0.095	-6.185	0.0002	-0.807	-0.368
n = 0.8745	x1	0.8745	0.0308	28.42	4E-10	0.8035	0.9454

13.- Mixer Viscometry, 25%, 0.3501%, 71.13 g corn syrup, 55°C, 24.9, 22.1 g $CaCO_3$

rpm	readings								Average
1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
4	0.5	0.4	0.5	0.4	0.5	0.4	0.5	0.5	0.4625
8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
16	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
32	3.8	3.8	3.9	3.8	3.9	3.8	3.9	3.8	3.8375
64	7.5	7.6	7.6	7.5	7.6	7.6	7.5	7.6	7.5625
128	15.3	15.3	15.3	15.3	15.4	15.4	15.4	15.4	15.35
256	31.3	31.3	31.3	31.3	31.3	31.2	31.3	31.3	31.288
512	65.4	65.4	65.4	65.4	65.4	65.4	65.5	65.4	65.413
256	30.7	30.7	30.8	30.7	30.8	30.8	30.8	30.9	30.775
128	14.9	14.9	14.9	14.9	14.9	14.9	14.9	15	14.913
64	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
32	3.8	3.8	3.9	3.8	3.9	3.9	3.8	3.9	3.85
16	2	2	2	2	2	2	2	2	2
8	1	1	1.1	1	1.1	1	1	1.1	1.0375
4	0.6	0.5	0.6	0.5	0.6	0.5	0.6	0.5	0.55
2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1	0.1	0.2	0.1	0.1	0.2	0.1	0.2	0.1	0.1375

rpm	rad/s omega	(N cm) M	(N m) M	Log Om	Log M
1	0.1047	0.0014	1E-05	-0.98	-4.845
2	0.2094	0.0029	3E-05	-0.679	-4.544
4	0.4188	0.0066	7E-05	-0.378	-4.18
8	0.8376	0.0129	0.0001	-0.077	-3.891
16	1.6752	0.0271	0.0003	0.2241	-3.566
32	3.3504	0.0548	0.0005	0.5251	-3.261
64	6.7008	0.108	0.0011	0.8261	-2.966
128	13.402	0.2193	0.0022	1.1272	-2.659
256	26.803	0.447	0.0045	1.4282	-2.35
512	53.606	0.9346	0.0093	1.7292	-2.029
256	26.803	0.4397	0.0044	1.4282	-2.357
128	13.402	0.2131	0.0021	1.1272	-2.672
64	6.7008	0.1072	0.0011	0.8261	-2.97
32	3.3504	0.055	0.0006	0.5251	-3.26
16	1.6752	0.0286	0.0003	0.2241	-3.544
8	0.8376	0.0148	0.0001	-0.077	-3.829
4	0.4188	0.0079	8E-05	-0.378	-4.105
2	0.2094	0.0043	4E-05	-0.679	-4.368
1	0.1047	0.002	2E-05	-0.98	-4.707

Determination of average shear rate
average shear rate = 4.47 angular velocity   b = 0.02692 m
average apparent viscosity = shear stress/ shear   d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.1301	-0.759	-2.039	0.278
2	0.2094	0.936	0.2602	-0.066	-1.346	0.278
4	0.4188	1.872	0.6017	0.627	-0.508	0.3214
8	0.8376	3.7441	1.1709	1.3202	0.1578	0.3127
16	1.6752	7.4881	2.4719	2.0133	0.905	0.3301
32	3.3504	14.976	4.9926	2.7065	1.608	0.3334
64	6.7008	29.953	9.8389	3.3996	2.2863	0.3285
128	13.402	59.905	19.971	4.0928	2.9943	0.3334
256	26.803	119.81	40.705	4.7859	3.7064	0.3397
512	53.606	239.62	85.103	5.4791	4.4439	0.3552
				x	y	

Regression Statistics
R Square 0.9997
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.2951	Interce	-1.221	0.0193	-63.31	3E-13	-1.265	-1.176
n = 1.0345	x1	1.0345	0.0062	165.67	5E-17	1.0201	1.0489

13 a.- Mixer Viscometry, 25%, 0.3501%, 71.13 g corn syrup, 55°C, 24.9, 22.1 g CaCO3

rpm	readings								Average
1	0.2333	0.2333	0.2333	0.2333	0.2333	0.2333	0.2333	0.2333	0.2333
2	0.3333	0.3667	0.3667	0.3667	0.3667	0.3333	0.3667	0.3667	0.3583
4	0.6333	0.6333	0.6	0.6	0.6	0.6	0.6	0.6	0.6083
8	1.1	1.1	1	1.1	1	1.1	1	1.1	1.0625
16	2	1.9	1.9	1.9	1.9	2	1.9	1.9	1.925
32	3.7	3.7	3.7	3.6	3.7	3.7	3.7	3.6	3.675
64	7.1	7.2	7.1	7.2	7.1	7.2	7.1	7.1	7.1375
128	14.3	14.3	14.3	14.3	14.4	14.3	14.4	14.3	14.325
256	29.7	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.613
512	66.8	66.7	66.8	66.8	66.8	67	67	67.2	66.888
256	28.8	28.9	28.8	28.9	28.8	28.8	28.9	28.9	28.85
128	13.9	13.9	13.9	13.8	13.9	13.9	13.9	13.8	13.875
64	7	7.1	7	7.1	7	7	6.9	7	7.0125
32	3.7	3.6	3.7	3.6	3.7	3.7	3.6	3.6	3.65
16	1.9	1.9	1.8	1.9	1.9	1.8	1.9	1.9	1.875
8	0.9	1	9	1	0.9	1	1	1	1.975
4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.3	0.2625
1	0.1667	0.1667	0.1667	0.2	0.1667	0.1667	0.1667	0.1667	0.1708

rpm	rad/s omega	(N cm) M	(N m) M	Log Om	Log M
1	0.1047	0.0033	3E-05	-0.98	-4.477
2	0.2094	0.0051	5E-05	-0.679	-4.291
4	0.4188	0.0087	9E-05	-0.378	-4.061
8	0.8376	0.0152	0.0002	-0.077	-3.819
16	1.6752	0.0275	0.0003	0.2241	-3.561
32	3.3504	0.0525	0.0005	0.5251	-3.28
64	6.7008	0.102	0.001	0.8261	-2.992
128	13.402	0.2047	0.002	1.1272	-2.689
256	26.803	0.4231	0.0042	1.4282	-2.374
512	53.606	0.9556	0.0096	1.7292	-2.02
256	26.803	0.4122	0.0041	1.4282	-2.385
128	13.402	0.1982	0.002	1.1272	-2.703
64	6.7008	0.1002	0.001	0.8261	-2.999
32	3.3504	0.0521	0.0005	0.5251	-3.283
16	1.6752	0.0268	0.0003	0.2241	-3.572
8	0.8376	0.0282	0.0003	-0.077	-3.549
4	0.4188	0.0071	7E-05	-0.378	-4.146
2	0.2094	0.0038	4E-05	-0.679	-4.426
1	0.1047	0.0024	2E-05	-0.98	-4.612

Determination of average shear rate
average shear rate = 4.47 angular velocity b = 0.02692 m
average apparent viscosity = shear stress/ shear d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.3036	-0.759	-1.192	0.6486
2	0.2094	0.936	0.4662	-0.066	-0.763	0.4981
4	0.4188	1.872	0.7915	0.627	-0.234	0.4228
8	0.8376	3.7441	1.3823	1.3202	0.3238	0.3692
16	1.6752	7.4881	2.5045	2.0133	0.9181	0.3345
32	3.3504	14.976	4.7812	2.7065	1.5647	0.3193
64	6.7008	29.953	9.286	3.3996	2.2285	0.31
128	13.402	59.905	18.637	4.0928	2.9252	0.3111
256	26.803	119.81	38.526	4.7859	3.6513	0.3216
512	53.606	239.62	87.022	5.4791	4.4662	0.3632
				x	y	

Regression Statistics
R Square 0.9939
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 0.4692	Interce	-0.757	0.078	-9.704	5E-06	-0.937	-0.577
n = 0.9092	x1	0.9092	0.0253	35.998	5E-11	0.8509	0.9674

14.- Mixer Viscometry, 35%, 35%, 62.2 g corn syrup, 21.7 g CaCO3

rpm	readings								Average
1	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
2	1.4	1.3	1.4	1.3	1.4	1.4	1.3	1.4	1.3625
4	2.3	2.4	2.3	2.4	2.3	2.3	2.3	2.3	2.325
8	4	4	4	4	4	4	4	4	4
16	6.9	6.9	7	6.9	6.9	7	6.9	7	6.9375
32	12.2	12.3	12.3	12.2	12.2	12.2	12.3	12.2	12.238
64	22	21.9	22	21.9	21.9	22	21.9	22	21.95
128	40.3	40.1	40	40.1	40	40	39.9	39.8	40.025
256	72.4	72.3	72.3	72.2	72.1	72	72	72	72.163
128	33.7	33.7	33.7	33.7	33.7	33.7	33.8	33.7	33.713
64	20.3	20.3	20.2	20.1	20	20.1	20	20	20.125
32	11.5	11.4	11.4	11.4	11.4	11.4	11.5	11.4	11.425
16	6.6	6.5	6.6	6.5	6.6	6.5	6.6	6.5	6.55
8	3.7	3.7	3.7	3.8	3.7	3.7	3.6	3.7	3.7
4	2.1	2.1	2.1	2.1	2	2.1	2	2.1	2.075
2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
1	0.7	0.6	0.7	0.6	0.7	0.6	0.7	0.6	0.65

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.0114	0.0001	-0.98	-3.942
2	0.2094	0.0195	0.0002	-0.679	-3.711
4	0.4188	0.0332	0.0003	-0.378	-3.479
8	0.8376	0.0571	0.0006	-0.077	-3.243
16	1.6752	0.0991	0.001	0.2241	-3.004
32	3.3504	0.1748	0.0017	0.5251	-2.757
64	6.7008	0.3136	0.0031	0.8261	-2.504
128	13.402	0.5718	0.0057	1.1272	-2.243
256	26.803	1.031	0.0103	1.4282	-1.987
128	13.402	0.4817	0.0048	1.1272	-2.317
64	6.7008	0.2875	0.0029	0.8261	-2.541
32	3.3504	0.1632	0.0016	0.5251	-2.787
16	1.6752	0.0936	0.0009	0.2241	-3.029
8	0.8376	0.0529	0.0005	-0.077	-3.277
4	0.4188	0.0296	0.0003	-0.378	-3.528
2	0.2094	0.0171	0.0002	-0.679	-3.766
1	0.1047	0.0093	9E-05	-0.98	-4.032

Determination of average shear rate
average shear rate = 4.47 angular velocity b = 0.02692 m
average apparent viscosity = shear stress/ shear d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

	angular	average	average			Sigma/
						Gamma
	velocit	shear	shear	Lnshear	Lnshear	viscos
rpm	rad/s	rate	stress	rate	stress	Pa.s
1	0.1047	0.468	1.0408	-0.759	0.04	2.2239
2	0.2094	0.936	1.7726	-0.066	0.5725	1.8938
4	0.4188	1.872	3.0249	0.627	1.1069	1.6158
8	0.8376	3.7441	5.2041	1.3202	1.6494	1.3899
16	1.6752	7.4881	9.0258	2.0133	2.2001	1.2053
32	3.3504	14.976	15.921	2.7065	2.7676	1.0631
64	6.7008	29.953	28.557	3.3996	3.3519	0.9534
128	13.402	59.905	52.073	4.0928	3.9526	0.8693
256	26.803	119.81	93.884	4.7859	4.5421	0.7836
512	53.606	239.62	43.86	5.4791	3.781	0.183
				x	y	

Regression Statistics
R Square 0.9492
Observations 10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 2.0496	Interce	0.7176	0.1796	3.9948	0.0031	0.3034	1.1319
n = 0.7114	x1	0.7114	0.0582	12.227	7E-07	0.5772	0.8456

15.- Mixer Viscometry, 35%, 35%, 65.5 g corn syrup, T = 40.8°C, 22.9 g CaCO3

rpm	readings								Average
1	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
4	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.15
8	3.7	3.7	3.8	3.7	3.7	3.8	3.8	3.8	3.75
16	6.7	6.6	6.7	6.6	6.7	6.7	6.7	6.7	6.675
32	11.9	12	12	11.9	11.9	11.9	12	11.9	11.938
64	21.7	21.5	21.7	21.6	21.6	21.5	21.7	21.6	21.613
128	39.2	39.3	39.2	39.1	39.2	39	38.9	39	39.113
256	71.2	71.6	71.4	71.4	71.2	71.2	71.1	71.2	71.288
128	38	38	37.9	38.1	38.1	38.1	38.1	38	38.038
64	20.9	20.9	20.9	20.9	21	21	21	20.9	20.938
32	11.7	11.6	11.6	11.6	11.6	11.7	11.6	11.6	11.625
16	6.5	6.5	6.5	6.5	6.5	6.4	6.4	6.4	6.4625
8	3.7	3.6	3.7	3.6	3.7	3.6	3.7	3.7	3.6625
4	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
1	0.7	0.6	0.7	0.6	0.7	0.6	0.7	0.7	0.6625

	rad/s	(N cm)	(N m)		
rpm	omega	M	M	Log Om	Log M
1	0.1047	0.01	0.0001	-0.98	-4
2	0.2094	0.0171	0.0002	-0.679	-3.766
4	0.4188	0.0307	0.0003	-0.378	-3.513
8	0.8376	0.0536	0.0005	-0.077	-3.271
16	1.6752	0.0954	0.001	0.2241	-3.021
32	3.3504	0.1706	0.0017	0.5251	-2.768
64	6.7008	0.3088	0.0031	0.8261	-2.51
128	13.402	0.5588	0.0056	1.1272	-2.253
256	26.803	1.0185	0.0102	1.4282	-1.992
128	13.402	0.5434	0.0054	1.1272	-2.265
64	6.7008	0.2991	0.003	0.8261	-2.524
32	3.3504	0.1661	0.0017	0.5251	-2.78
16	1.6752	0.0923	0.0009	0.2241	-3.035
8	0.8376	0.0523	0.0005	-0.077	-3.281
4	0.4188	0.03	0.0003	-0.378	-3.523
2	0.2094	0.0171	0.0002	-0.679	-3.766
1	0.1047	0.0095	9E-05	-0.98	-4.024

Determination of average shear rate
average shear rate = 4.47 angular velocity b = 0.02692 m
average apparent viscosity = shear stress/ shear d = 0.04143 m
k' = 4.47
K = consistency coefficient, Pa.s^n
average shear stress = 2 M / ((pi d^3* (b/d + 1/3)))
b/d + 1/3 = 0.9831
shear stress= M 9106.2 e103

rpm	angular velocit rad/s	average shear rate	average shear stress	Lnshear rate	Lnshear stress	Sigma/ Gamma viscos Pa.s
1	0.1047	0.468	0.9107	-0.759	-0.094	1.9459
2	0.2094	0.936	1.5612	-0.066	0.4455	1.6679
4	0.4188	1.872	2.7972	0.627	1.0286	1.4942
8	0.8376	3.7441	4.8788	1.3202	1.5849	1.3031
16	1.6752	7.4881	8.6843	2.0133	2.1615	1.1597
32	3.3504	14.976	15.531	2.7065	2.7428	1.037
64	6.7008	29.953	28.118	3.3996	3.3364	0.9388
128	13.402	59.905	50.886	4.0928	3.9296	0.8494
256	26.803	119.81	92.746	4.7859	4.5299	0.7741
512	53.606	239.62	49.487	5.4791	3.9017	0.2065
				x	y	

Regression Statistics

R square	0.9600
Observations	10

		Coeffic	Standar	t Stati	P-value	Lower 95%	Upper 95%
K = 1.8315	Interce	0.6051	0.1654	3.6587	0.0052	0.2237	0.9866
n = 0.7422	x1	0.7422	0.0536	13.855	2E-07	0.6187	0.8658

XIII. APPENDIX 7. CALCULATIONS AT 55°C TO FIT THE GLOBAL MODEL.

These calculations were used to fit a model using the values coming from the three different temperatures.

MIX55-1.WK1

sstres	ln sstress	55-0-1 k	lnk	T	1/T	C	srate	ln srate
0.0976	-2.327	0.1295	-2.044	328.15	0.003	0	0.468	-0.759
0.1464	-1.922	0.1295	-2.044	328.15	0.003	0	0.936	-0.066
0.2439	-1.411	0.1295	-2.044	328.15	0.003	0	1.872	0.627
0.309	-1.174	0.1295	-2.044	328.15	0.003	0	3.7441	1.3202
0.6993	-0.358	0.1295	-2.044	328.15	0.003	0	7.4881	2.0133
1.301	0.2631	0.1295	-2.044	328.15	0.003	0	14.976	2.7065
2.7647	1.0169	0.1295	-2.044	328.15	0.003	0	29.953	3.3996
6.131	1.8134	0.1295	-2.044	328.15	0.003	0	59.905	4.0928
15.206	2.7217	0.1295	-2.044	328.15	0.003	0	119.81	4.7859
43.031	3.7619	0.1295	-2.044	328.15	0.003	0	239.62	5.4791

sstres	ln sstress	55-0-2 k	lnk	T	1/T	C	srate	ln srate
0.1301	-2.039	0.1896	-1.663	328.15	0.003	0	0.468	-0.759
0.1789	-1.721	0.1896	-1.663	328.15	0.003	0	0.936	-0.066
0.2602	-1.346	0.1896	-1.663	328.15	0.003	0	1.872	0.627
1.1709	0.1578	0.1896	-1.663	328.15	0.003	0	3.7441	1.3202
0.8294	-0.187	0.1896	-1.663	328.15	0.003	0	7.4881	2.0133
1.3335	0.2878	0.1896	-1.663	328.15	0.003	0	14.976	2.7065
2.6508	0.9749	0.1896	-1.663	328.15	0.003	0	29.953	3.3996
6.0009	1.7919	0.1896	-1.663	328.15	0.003	0	59.905	4.0928
15.173	2.7195	0.1896	-1.663	328.15	0.003	0	119.81	4.7859
42.999	3.7612	0.1896	-1.663	328.15	0.003	0	239.62	5.4791

sstres	ln sstress	55-0-3 k	lnk	T	1/T	C	srate	ln srate
0.1301	-2.039	0.1653	-1.8	328.15	0.003	0	0.468	-0.759
0.1952	-1.634	0.1653	-1.8	328.15	0.003	0	0.936	-0.066
0.2602	-1.346	0.1653	-1.8	328.15	0.003	0	1.872	0.627
0.4554	-0.787	0.1653	-1.8	328.15	0.003	0	3.7441	1.3202
0.7969	-0.227	0.1653	-1.8	328.15	0.003	0	7.4881	2.0133
1.301	0.2631	0.1653	-1.8	328.15	0.003	0	14.976	2.7065
2.6671	0.981	0.1653	-1.8	328.15	0.003	0	29.953	3.3996
5.9847	1.7892	0.1653	-1.8	328.15	0.003	0	59.905	4.0928
14.978	2.7066	0.1653	-1.8	328.15	0.003	0	119.81	4.7859
42.641	3.7528	0.1653	-1.8	328.15	0.003	0	239.62	5.4791

sstres	ln sstress	55-5-1 k	lnk	T	1/T	C	srate	ln srate
0.6505	-0.43	0.5706	-0.561	328.15	0.003	5	0.468	-0.759
0.7481	-0.29	0.5706	-0.561	328.15	0.003	5	0.936	-0.066
0.8294	-0.187	0.5706	-0.561	328.15	0.003	5	1.872	0.627
1.0408	0.04	0.5706	-0.561	328.15	0.003	5	3.7441	1.3202
1.301	0.2631	0.5706	-0.561	328.15	0.003	5	7.4881	2.0133
1.9515	0.6686	0.5706	-0.561	328.15	0.003	5	14.976	2.7065
3.5453	1.2656	0.5706	-0.561	328.15	0.003	5	29.953	3.3996
7.4158	2.0036	0.5706	-0.561	328.15	0.003	5	59.905	4.0928
17.856	2.8824	0.5706	-0.561	328.15	0.003	5	119.81	4.7859
49.471	3.9014	0.5706	-0.561	328.15	0.003	5	239.62	5.4791

sstres	ln sstress	55-5-2 k	lnk	T	1/T	C	srate	ln srate
0.0867	-2.445	0.1244	-2.084	328.15	0.003	5	0.468	-0.759
0.1301	-2.039	0.1244	-2.084	328.15	0.003	5	0.936	-0.066
0.2168	-1.529	0.1244	-2.084	328.15	0.003	5	1.872	0.627
0.3903	-0.941	0.1244	-2.084	328.15	0.003	5	3.7441	1.3202
0.7481	-0.29	0.1244	-2.084	328.15	0.003	5	7.4881	2.0133
1.4962	0.4029	0.1244	-2.084	328.15	0.003	5	14.976	2.7065
3.1224	1.1386	0.1244	-2.084	328.15	0.003	5	29.953	3.3996
6.9442	1.9379	0.1244	-2.084	328.15	0.003	5	59.905	4.0928
17.11	2.8397	0.1244	-2.084	328.15	0.003	5	119.81	4.7859
48.3	3.8774	0.1244	-2.084	328.15	0.003	5	239.62	5.4791

sstres	ln sstress	55-5-3 k	lnk	T	1/T	C	srate	ln srate
0.1301	-2.039	0.2039	-1.59	328.15	0.003	5	0.468	-0.759
0.2602	-1.346	0.2039	-1.59	328.15	0.003	5	0.936	-0.066
0.3415	-1.074	0.2039	-1.59	328.15	0.003	5	1.872	0.627
0.5367	-0.622	0.2039	-1.59	328.15	0.003	5	3.7441	1.3202
0.9758	-0.025	0.2039	-1.59	328.15	0.003	5	7.4881	2.0133
1.6425	0.4962	0.2039	-1.59	328.15	0.003	5	14.976	2.7065
6.6026	1.8875	0.2039	-1.59	328.15	0.003	5	29.953	3.3996
7.3507	1.9948	0.2039	-1.59	328.15	0.003	5	59.905	4.0928
17.547	2.8649	0.2039	-1.59	328.15	0.003	5	119.81	4.7859
49.308	3.8981	0.2039	-1.59	328.15	0.003	5	239.62	5.4791

	ln	55-5-4						ln
sstres	sstress	k	lnk	T	1/T	C	srate	srate
0.2277	-1.48	0.223	-1.501	328.15	0.003	5	0.468	-0.759
0.2602	-1.346	0.223	-1.501	328.15	0.003	5	0.936	-0.066
0.3253	-1.123	0.223	-1.501	328.15	0.003	5	1.872	0.627
0.5204	-0.653	0.223	-1.501	328.15	0.003	5	3.7441	1.3202
0.8294	-0.187	0.223	-1.501	328.15	0.003	5	7.4881	2.0133
1.4962	0.4029	0.223	-1.501	328.15	0.003	5	14.976	2.7065
3.1224	1.1386	0.223	-1.501	328.15	0.003	5	29.953	3.3996
7.1556	1.9679	0.223	-1.501	328.15	0.003	5	59.905	4.0928
17.434	2.8584	0.223	-1.501	328.15	0.003	5	119.81	4.7859
49.439	3.9007	0.223	-1.501	328.15	0.003	5	239.62	5.4791

	ln	55-15-1						ln
sstres	sstress	k	lnk	T	1/T	C	srate	srate
0.1301	-2.039	0.2065	-1.577	328.15	0.003	15	0.468	-0.759
0.1952	-1.634	0.2065	-1.577	328.15	0.003	15	0.936	-0.066
0.3903	-0.941	0.2065	-1.577	328.15	0.003	15	1.872	0.627
0.6993	-0.358	0.2065	-1.577	328.15	0.003	15	3.7441	1.3202
1.2685	0.2378	0.2065	-1.577	328.15	0.003	15	7.4881	2.0133
2.3744	0.8647	0.2065	-1.577	328.15	0.003	15	14.976	2.7065
4.8463	1.5782	0.2065	-1.577	328.15	0.003	15	29.953	3.3996
10.229	2.3252	0.2065	-1.577	328.15	0.003	15	59.905	4.0928
23.548	3.1591	0.2065	-1.577	328.15	0.003	15	119.81	4.7859
63.685	4.1539	0.2065	-1.577	328.15	0.003	15	239.62	5.4791

	ln	55-15-2						ln
sstres	sstress	k	lnk	T	1/T	C	srate	srate
0.2114	-1.554	0.2954	-1.219	328.15	0.003	15	0.468	-0.759
0.3469	-1.059	0.2954	-1.219	328.15	0.003	15	0.936	-0.066
0.515	-0.664	0.2954	-1.219	328.15	0.003	15	1.872	0.627
0.824	-0.194	0.2954	-1.219	328.15	0.003	15	3.7441	1.3202
1.2522	0.2249	0.2954	-1.219	328.15	0.003	15	7.4881	2.0133
2.3852	0.8693	0.2954	-1.219	328.15	0.003	15	14.976	2.7065
4.8463	1.5782	0.2954	-1.219	328.15	0.003	15	29.953	3.3996
10.327	2.3347	0.2954	-1.219	328.15	0.003	15	59.905	4.0928
24.009	3.1784	0.2954	-1.219	328.15	0.003	15	119.81	4.7859
65.181	4.1772	0.2954	-1.219	328.15	0.003	15	239.62	5.4791

	ln	55-15-3						ln
sstres	sstress	k	lnk	T	1/T	C	srate	srate
0.0434	-3.138	0.1322	-2.023	328.15	0.003	15	0.468	-0.759
0.1301	-2.039	0.1322	-2.023	328.15	0.003	15	0.936	-0.066
0.3415	-1.074	0.1322	-2.023	328.15	0.003	15	1.872	0.627
0.6505	-0.43	0.1322	-2.023	328.15	0.003	15	3.7441	1.3202
1.301	0.2631	0.1322	-2.023	328.15	0.003	15	7.4881	2.0133
2.5532	0.9374	0.1322	-2.023	328.15	0.003	15	14.976	2.7065
5.2041	1.6494	0.1322	-2.023	328.15	0.003	15	29.953	3.3996
10.945	2.3929	0.1322	-2.023	328.15	0.003	15	59.905	4.0928
24.979	3.2181	0.1322	-2.023	328.15	0.003	15	119.81	4.7859
66.092	4.191	0.1322	-2.023	328.15	0.003	15	239.62	5.4791

	ln	55-25-1						ln
sstres	sstress	k	lnk	T	1/T	C	srate	srate
0.2169	-1.528	0.4165	-0.876	328.15	0.003	25	0.468	-0.759
0.4011	-0.913	0.4165	-0.876	328.15	0.003	25	0.936	-0.066
0.7806	-0.248	0.4165	-0.876	328.15	0.003	25	1.872	0.627
1.4311	0.3585	0.4165	-0.876	328.15	0.003	25	3.7441	1.3202
2.7159	0.9991	0.4165	-0.876	328.15	0.003	25	7.4881	2.0133
5.2041	1.6494	0.4165	-0.876	328.15	0.003	25	14.976	2.7065
10.262	2.3284	0.4165	-0.876	328.15	0.003	25	29.953	3.3996
20.832	3.0365	0.4165	-0.876	328.15	0.003	25	59.905	4.0928
42.527	3.7501	0.4165	-0.876	328.15	0.003	25	119.81	4.7859
91.852	4.5202	0.4165	-0.876	328.15	0.003	25	239.62	5.4791

	ln	55-25-2						ln
sstres	sstress	k	lnk	T	1/T	C	srate	srate
0.0922	-2.384	0.1448	-1.932	328.15	0.003	25	0.468	-0.759
0.0434	-3.138	0.1448	-1.932	328.15	0.003	25	0.936	-0.066
0.3469	-1.059	0.1448	-1.932	328.15	0.003	25	1.872	0.627
0.9432	-0.058	0.1448	-1.932	328.15	0.003	25	3.7441	1.3202
2.1467	0.7639	0.1448	-1.932	328.15	0.003	25	7.4881	2.0133
4.6186	1.5301	0.1448	-1.932	328.15	0.003	25	14.976	2.7065
9.286	2.2285	0.1448	-1.932	328.15	0.003	25	29.953	3.3996
16.832	2.8233	0.1448	-1.932	328.15	0.003	25	59.905	4.0928
39.616	3.6792	0.1448	-1.932	328.15	0.003	25	119.81	4.7859
89.803	4.4976	0.1448	-1.932	328.15	0.003	25	239.62	5.4791

sstres	ln sstress	55-25-3 k	lnk	T	1/T	C	srate	ln srate
0.1301	-2.039	0.3193	-1.142	328.15	0.003	25	0.468	-0.759
0.3253	-1.123	0.3193	-1.142	328.15	0.003	25	0.936	-0.066
0.6505	-0.43	0.3193	-1.142	328.15	0.003	25	1.872	0.627
1.301	0.2631	0.3193	-1.142	328.15	0.003	25	3.7441	1.3202
2.4557	0.8984	0.3193	-1.142	328.15	0.003	25	7.4881	2.0133
4.6023	1.5266	0.3193	-1.142	328.15	0.003	25	14.976	2.7065
9.1396	2.2126	0.3193	-1.142	328.15	0.003	25	29.953	3.3996
18.637	2.9252	0.3193	-1.142	328.15	0.003	25	59.905	4.0928
38.575	3.6526	0.3193	-1.142	328.15	0.003	25	119.81	4.7859
86.274	4.4575	0.3193	-1.142	328.15	0.003	25	239.62	5.4791

sstres	ln sstress	55-25-4 k	lnk	T	1/T	C	srate	ln srate
0.3903	-0.941	0.5625	-0.575	328.15	0.003	25	0.468	-0.759
0.6017	-0.508	0.5625	-0.575	328.15	0.003	25	0.936	-0.066
0.9107	-0.094	0.5625	-0.575	328.15	0.003	25	1.872	0.627
1.4962	0.4029	0.5625	-0.575	328.15	0.003	25	3.7441	1.3202
2.602	0.9563	0.5625	-0.575	328.15	0.003	25	7.4881	2.0133
4.9439	1.5981	0.5625	-0.575	328.15	0.003	25	14.976	2.7065
9.6275	2.2646	0.5625	-0.575	328.15	0.003	25	29.953	3.3996
19.255	2.9578	0.5625	-0.575	328.15	0.003	25	59.905	4.0928
39.876	3.6858	0.5625	-0.575	328.15	0.003	25	119.81	4.7859
88.241	4.4801	0.5625	-0.575	328.15	0.003	25	239.62	5.4791

sstres	ln sstress	55-25-5 k	lnk	T	1/T	C	srate	ln srate
0.374	-0.983	0.5557	-0.588	328.15	0.003	25	0.468	-0.759
0.6017	-0.508	0.5557	-0.588	328.15	0.003	25	0.936	-0.066
0.9107	-0.094	0.5557	-0.588	328.15	0.003	25	1.872	0.627
1.4962	0.4029	0.5557	-0.588	328.15	0.003	25	3.7441	1.3202
2.602	0.9563	0.5557	-0.588	328.15	0.003	25	7.4881	2.0133
4.9439	1.5981	0.5557	-0.588	328.15	0.003	25	14.976	2.7065
9.6275	2.2646	0.5557	-0.588	328.15	0.003	25	29.953	3.3996
19.255	2.9578	0.5557	-0.588	328.15	0.003	25	59.905	4.0928
39.876	3.6858	0.5557	-0.588	328.15	0.003	25	119.81	4.7859
88.241	4.4801	0.5557	-0.588	328.15	0.003	25	239.62	5.4791

sstres	ln sstress	55-25-6 k	lnk	T	1/T	C	srate	ln srate
0.1301	-2.039	0.2951	-1.22	328.15	0.003	25	0.468	-0.759
0.2602	-1.346	0.2951	-1.22	328.15	0.003	25	0.936	-0.066
0.6017	-0.508	0.2951	-1.22	328.15	0.003	25	1.872	0.627
1.1709	0.1578	0.2951	-1.22	328.15	0.003	25	3.7441	1.3202
2.4719	0.905	0.2951	-1.22	328.15	0.003	25	7.4881	2.0133
4.9926	1.608	0.2951	-1.22	328.15	0.003	25	14.976	2.7065
9.8389	2.2863	0.2951	-1.22	328.15	0.003	25	29.953	3.3996
19.971	2.9943	0.2951	-1.22	328.15	0.003	25	59.905	4.0928
40.705	3.7064	0.2951	-1.22	328.15	0.003	25	119.81	4.7859
85.103	4.4439	0.2951	-1.22	328.15	0.003	25	239.62	5.4791

sstres	ln sstress	55-25-7 k	lnk	T	1/T	C	srate	ln srate
0.3036	-1.192	0.4692	-0.757	328.15	0.003	25	0.468	-0.759
0.4662	-0.763	0.4692	-0.757	328.15	0.003	25	0.936	-0.066
0.7915	-0.234	0.4692	-0.757	328.15	0.003	25	1.872	0.627
1.3823	0.3238	0.4692	-0.757	328.15	0.003	25	3.7441	1.3202
2.5045	0.9181	0.4692	-0.757	328.15	0.003	25	7.4881	2.0133
4.7812	1.5647	0.4692	-0.757	328.15	0.003	25	14.976	2.7065
9.286	2.2285	0.4692	-0.757	328.15	0.003	25	29.953	3.3996
18.637	2.9252	0.4692	-0.757	328.15	0.003	25	59.905	4.0928
38.526	3.6513	0.4692	-0.757	328.15	0.003	25	119.81	4.7859
87.022	4.4662	0.4692	-0.757	328.15	0.003	25	239.62	5.4791

sstres	ln sstress	55-35-1 k	lnk	T	1/T	C	srate	ln srate
1.0408	0.04	2.0496	0.7176	328.15	0.003	35	0.468	-0.759
1.7726	0.5725	2.0496	0.7176	328.15	0.003	35	0.936	-0.066
3.0249	1.1069	2.0496	0.7176	328.15	0.003	35	1.872	0.627
5.2041	1.6494	2.0496	0.7176	328.15	0.003	35	3.7441	1.3202
9.0258	2.2001	2.0496	0.7176	328.15	0.003	35	7.4881	2.0133
15.921	2.7676	2.0496	0.7176	328.15	0.003	35	14.976	2.7065
28.557	3.3519	2.0496	0.7176	328.15	0.003	35	29.953	3.3996
52.073	3.9526	2.0496	0.7176	328.15	0.003	35	59.905	4.0928
93.884	4.5421	2.0496	0.7176	328.15	0.003	35	119.81	4.7859

	ln	55-35-2						ln
sstres	sstress	k	lnk	T	1/T	C	srate	srate
0.9107	-0.094	1.8315	0.6051	328.15	0.003	35	0.468	-0.759
1.5612	0.4455	1.8315	0.6051	328.15	0.003	35	0.936	-0.066
2.7972	1.0286	1.8315	0.6051	328.15	0.003	35	1.872	0.627
4.8788	1.5849	1.8315	0.6051	328.15	0.003	35	3.7441	1.3202
8.6843	2.1615	1.8315	0.6051	328.15	0.003	35	7.4881	2.0133
15.531	2.7428	1.8315	0.6051	328.15	0.003	35	14.976	2.7065
28.118	3.3364	1.8315	0.6051	328.15	0.003	35	29.953	3.3996
50.886	3.9296	1.8315	0.6051	328.15	0.003	35	59.905	4.0928
92.746	4.5299	1.8315	0.6051	328.15	0.003	35	119.81	4.7859

	ln	55-35-3						ln
sstres	sstress	k	lnk	T	1/T	C	srate	srate
0.9107	-0.094	1.8315	0.6051	328.15	0.003	35	0.468	-0.759
1.5612	0.4455	1.8315	0.6051	328.15	0.003	35	0.936	-0.066
2.7972	1.0286	1.8315	0.6051	328.15	0.003	35	1.872	0.627
4.8788	1.5849	1.8315	0.6051	328.15	0.003	35	3.7441	1.3202
8.6843	2.1615	1.8315	0.6051	328.15	0.003	35	7.4881	2.0133
15.531	2.7428	1.8315	0.6051	328.15	0.003	35	14.976	2.7065
28.118	3.3364	1.8315	0.6051	328.15	0.003	35	29.953	3.3996
50.886	3.9296	1.8315	0.6051	328.15	0.003	35	59.905	4.0928
92.746	4.5299	1.8315	0.6051	328.15	0.003	35	119.81	4.7859

	ln	55-35-4						ln
sstres	sstress	k	lnk	T	1/T	C	srate	srate
0.9107	-0.094	1.8097	0.5932	328.15	0.003	35	0.468	-0.759
1.5775	0.4558	1.8097	0.5932	328.15	0.003	35	0.936	-0.066
2.7321	1.0051	1.8097	0.5932	328.15	0.003	35	1.872	0.627
4.6837	1.5441	1.8097	0.5932	328.15	0.003	35	3.7441	1.3202
8.359	2.1233	1.8097	0.5932	328.15	0.003	35	7.4881	2.0133
15.173	2.7195	1.8097	0.5932	328.15	0.003	35	14.976	2.7065
27.338	3.3083	1.8097	0.5932	328.15	0.003	35	29.953	3.3996
49.097	3.8938	1.8097	0.5932	328.15	0.003	35	59.905	4.0928
90.42	4.5045	1.8097	0.5932	328.15	0.003	35	119.81	4.7859