[announcer] Michigan State College presents another program of farm electrification. We take you now to the new and very beautiful Agricultural Engineering Building on the South Campus. Here are housed in many offices, classrooms and laboratories, where problems of farm equipment operation and maintenance are studied. Here we find experts in the fields of farm equipment and farm building concerning themselves with the constant demand of our Michigan farmers to improve their production techniques. One of the most important needs of modern farm operation is the many uses of electricity. With the increasing demand of this great source of energy by our farmers, there is a growing need to disseminate more and more information about proper use, safety factors, and latest developments within the field of rural electrification. To help provide such information, we invite you to stop by with us now as we visit the Office of Farm Electrification here in the Agricultural Engineering Building, where our television host, Ken Richards, is awaiting us. [Ken Richards] Professor Wiant, it's very, very fine to have you drop in here at our Farm Electrification Office again today, and the information you have about electric motors is most interesting. You know, out there, I think you're going to enjoy this, too, because Professor Wiant has come over from the Agricultural Engineering Office, his own office, to tell us about electric motors. As a matter of fact, Prof, you just brought this particular motor in and put it on my desk, and we were talking about what motors can do. I wonder if you would tell our friends out there what these motors can do. [D. E. Wiant] I'll be glad to, Ken. Really the significant thing that i said about this motor was that here is a quarter horsepower motor. It does as much work as a man. The quarter horsepower motor will pump as much water in a day as a good man will. It will elevate four times as much grain to an overhead granary as a man will. You might remember your size of the motors and what they will do. Something like this. A one horsepower motor will do the work of eight men. And will do the work of a man for about ten cents per day. Now I'm going to talk about motors. I'm going to talk about three motors. I see I have four here. So Ken, I'm going to give this one to you if you'll get that out of the road. [Ken Richards] Very good Professor Wiant. [D. E. Wiant] And I'm going to talk about a specific kind of motors. Alternating current single phase 60 cycle motors. I have three motors here. These three motors are three out of at least 25,000. There are 25,000 motors manufactured 25,000 different kinds, and you might say "well then, how can the farmer decide which kind he should buy?" Well fortunately, there are only three types of motors that the farmer need be concerned with, and I have those three here. Now these are one-third horsepower motors. Here is the repulsion- start induction. Notice the sign, it's the repulsion-start induction run. And here is the capacitor- start induction run. And here is the split phase-start induction run. You'll notice from what I've said and from the signs that these motors run the same, operate the same, and the difference is in the starting. And that's the thing that makes each of these types of motors have a very specific place where it can be used. Let's take the RI motor first. The RI motor uses a wound armature with a commutator. Carbon brushes fit against the commutator and that part of the motor is merely for starting. Now of course it costs money to wind an armature and put in commutators and brushes and you'll have to think about that in a minute when we talk about the relative price of these motors. But the wound armature and the brushes identified the RI motor. I'm going to say "RI motor" now. There is a repulsion run induction motor, a repulsion run motor rather, but I'm going to talk about the RI and I'll mean the repulsion- start induction. Now the capacitor motor does not have the wound rotor that the RI motor has, just a simple rotor, but relies upon it starting on the condenser or capacitor. Looks like it's in can, generally fastened on the motor, usually on top. It's a convenient place for it. Of course, the rotor, not being long, makes it cost less than the RI. Of course, we have the cost of the

condenser to consider. Now, let's take the split phase motor. It has just a simple rotor like the capacitor, it has no condenser. In other words, you can identify this motor by what it does not have. Well now, let me repeat that the wound armature, the condenser, are the things that we rely upon to start these motors. And the split phase, the starting method, is merely by making it two-phase, or splitting the phase as they say, of the motor for starting. Now induction run motors, single-phase induction run motors, will not start without these methods of starting. That is a split-phase, the capacitor, or the wound armature. I want to show you that. I'm going to disconnect one of the starting leads on the capacitor motor and start it. If I give it a push, it will run. It would run either way, according to which way we start it. And of course, it's easily reversed by merely changing some of the winding. Now, as I said, these motors are all the same as far as they run. They have different methods of starting, and it's a method of starting which determines the place that these motors can be used. There are two important characteristics about motors that I think we should be concerned with, and one is how much current does the motor take to start. I might say that after the motor gets to running there's very little difference in the amount of current required as far as the different types are concerned. They all take about the same, but the difference is in the starting. So we'll measure our amperes that it takes to start these different motors. Now the ampere, of course, is the unit that we'll use when we talk about our ammeter. So if you will watch the scale, first I'll turn on the RI motor, about 10 amperes. Now we'll try the capacitor. Here's the capacitor, about 16 amperes. Now watch your split-phase. Here it is. Way up to the top, over 30. Ken, I wonder if you'd put those on the board, please. 10 for the RI, 16 for the capacitor, and 30 plus for the split-phase. Now you recall, I said the split- phase motor... these are one-third horsepower and this is just about as large as they can make a split-phase because of that large starting current. Now, of course, that current is important. But there is something that's more important than that. And that is, just how hard a load can these various motors start. Now Ken, if you'll help me just a minute, we'll put the brakes on these motors and we'll see if we can find out just how hard a job this motor can start. This is a brake arm, a Prony brake. They're used to measure the horsepower output of a motor. But we're going to clamp these brakes so that the rotor, the armature cannot turn, so that the shaft cannot turn, and then we're going to measure that effort. This is an ordinary milk scale. Now you will note that this brake arm, Prony brake arm, is just one foot long from the center of the shaft to the hook. And because this is measured in feet, and our scale will record in pounds, then we will have foot-pound, or to be technically correct, we'll have pounds- feet of torque. Now, let's try the RI. I have to watch the scales carefully, here we are. Six pounds on the scale, that would be six pounds-feet of starting torque. It'll give you some idea of how good a starter that is when I say that one pound on this scale would be the load for the motor when it was developing its one-third horsepower. Now we'll take our capacitor. We watch the scale very carefully. We get 4 pounds on the scale. That would be 4 pounds- feet of torque. Now we'll go to the split-phase. The split-phase, remember, used more than 30 amperes. That's a lot of electricity. That ought to make it a good starter. We'll see. Now watch very carefully. Only two pounds, only two foot-pounds. Evidently, then, the amount of current does not seem to affect the starting torque. Now let's compare these a little bit and see just what we have. Remember we said that these are all the same as far as running is concerned. They're induction, run motors, alternating current, single phase, 60 cycle. That's the kind of current that almost every farmer in Michigan, in fact, almost everybody in Michigan has. Now, you notice we didn't put our figures down here, did we, Mr. Richards? Okay, and if you'll just put those down, our starting torque on our RI is 6. [Ken Richards] Let me get right over here, Professor, so they can see. [D. E. Wiant] The starting torque on our

capacitor was 4, and on our split- phase it was only 2. Thank you. Now, let's talk about the use of these motors, and then we can see how the use of these depends upon our starting current, or more particularly, our starting torque. The RI motor is the oldest motor of the group, and it has a reputation of being the reliable motor. However, due to the development of the capacitor motor, the only place that we need the RI motor now is where you have exceptionally heavy starting loads. For instance, if you have a deep well pump, and if that was out away from the building, maybe that would be a good place to put your RI motor. But for most cases, your capacitor motor works very satisfactorily on all the places that you need a motor. Would you say then that we have these two that handle most of the cases? Why? A split-phase. The split-phase motor not having the wound armature or the capacitor, of course, is a lower cost motor. And when you have jobs that you can do when the motor starts under no load, why, then your split-phase motor will do a very satisfactory job. [Ken Richards] Professor Wiant, I'm sorry to have to interrupt all this very interesting information. Our time is just about up, and I think our friends out there might like to have some of this information on black and white. Is that possible? [D. E. Wiant] We have it right there. I brought it over with me, Mr. Richards. [Ken Richards] Well, all right. Fine. Let's go right back here to the desk a moment. And I'd like to say right now, for those of you out there, if you'd like this information, you may have it by sending for Electric Motor Information. You write to Television, Michigan State College. And now thank you very much, Professor Wiant, for joining us here today and telling us about electric motors. Thank you out there for joining us. This is Ken Richards, your television host, saying goodbye for now. [announcer] This has been another of the program Farm Electrification with television host Ken Richards and his guest today, Professor D.E. Wiant of Agricultural Engineering. Farm Electrification is brought to you in the hope that, through these visits, you may acquire helpful information about the proper use, safety factors, and latest developments within the field of rural and home electrification. We invite you to be our guests again next week at this time, when again we visit the Agricultural Engineering Building on the south campus of Michigan State College. This has been a video recording of Michigan State College Television. Thank you.