Converting single phase to three

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I have seen some boxes (with some capacitor circuits inside) which do single-phase power supply to 3-phase power supply conversion. The problem with them is that they cause the load motor to heat up, because the phase difference between the legs is 90 degrees instead of 120 degrees.

I"m understanding this question to mean that you"re trying to run a three-phase motor off a single-phase line. If you"re trying to run the motor directly off the AC line, the phase angles involved will make it difficult to get the motor started, which is part of the reason three-phase exists in the first place. Single-phase motors usually have motor start caps for just that reason. That sounds like what you"re describing.

The simple answer to your question is that to get three-phase AC from single-phase AC, you need to rectify the single-phase AC line into DC, then run the DC back through an inverter to get controlled three-phase AC. There are other electronic approaches, but they"re less common in my (limited) experience. There are also mechanical approaches, which may be more convenient if you have the parts.

I"d suggest using a drive to operate your three-phase motor. Typical variable-frequency three-phase drives are exactly what I described above: a rectifier, followed by an inverter. I can"t speak as to what"s on the market in a given power class, but larger three-phase drives typically have terminals for the three-phase AC line input, the DC bus, and the three-phase motor output. If you have those terminals, you have two options.

One is to run single-phase AC through the three-phase input of the drive. If the voltages are correct, the drive should operate fine. The caveat is that you"ll have to derate the drive somewhat. The input diodes are spec"d assuming that the drive"s constant-power load will be distributed among three legs of the rectifier. If you distribute that same load over just two legs, those diodes will get hotter. The internal bus capacitors will also get hotter, because they"ll see more ripple current without the third phase. Check with the drive manufacturer for the derating info.

If your drive has DC bus terminals, your other option is to skip it"s internal rectifier and use an external one. Rectify the single-phase AC, then use that DC as the input to the drive. This will let you avoid derating the drive. My company makes something exactly for that purpose, though its power range may be larger than is cost-effective for your application. You"d have to price both options out to find out for sure. Read this for more details.

If, however, you have a quadrature two-phase (which I doubt), it"s simple with just a transformer and proper windings (Scott-T transformer). The best option, though, would be a motor controller, but that can be expensive.

In the United States, most power entering people"s homes is one-phase power. The power generated at the

electricity power plant, however, is three-phase power. This is the idea behind those large transmission lines you see attached to tall towers - these lines are supposed to transmit as much voltage as is feasible over long distances before this power is "tapped" and delivered to neighborhoods at a greatly reduced voltage.

Single-phase power is sufficient for virtually all household appliances, whereas industrial settings featuring heavy equipment require three-phase power. But what if you need three-phase power and all you have is the single-phase power entering your home?

The information here is intended for academic purposes only - not instructional. Never experiment with or alter electrical wires in your home or anywhere else unless you have been specifically trained for the job.

Imagine yourself and two of your (obviously bored) friends walking back and forth at a brisk speed of 2 meters per second (about 4.5 miles per hour) along a path that runs north-south and measures 60 meters from end to end. Each of you starts at the midpoint of this path, walks to the northern end, returns to the start, continues walking to the opposite end, and returns again to the middle, thereby completing one 120-meter "lap," or cycle. Because each of you is walking at 2 meters per second, one round trip takes each person exactly 60 seconds.

This offers a model of what three-phase electrical power looks like, except that "voltage" is substituted for "status" and instead of one cycle occurring every 60 seconds, 60 voltage cycles occur each second. Plus, instead of each person passing the starting point twice per minute, the voltage passes through the zero point 120 times per second.