Blacksmithing Workshops and Classes:

Peters Valley Craft Education Center
19 Kuhn Rd., Layton, NJ 07851 (973)948-5200
pv@warwick.net www.pvcrafts.org

Academy of Traditional Arts
Carrol County Farm Museum
500 South Center St. Westminster, MD 21157
(410)848-7775 (410)876-2667

Touchstone Center for Crafts
R.D.#1, Box 60, Farmington, PA 15437
(724)329-1370 Fax: (724)329-1371

John C Campbell Folk School
One Folk School Rd.
Brasstown, NC 28902
1-800-365-5724 www.folkschool.com

Brookfield Craft Center
286 Whisconier Road
P. O. Box 122
Brookfield, CT 06804-0122
203.775.4526

Open Forges

If any members have a forge at home and work in the evenings or weekends and want to open it up to help a few local guys, let me know, Larry Brown, editor, as we get requests from members who have a hard time traveling to some of the open forge locations.
Please contact, Larry Brown, Editor.
We want to encourage all to join us at:

Monday Night Open Forge in N.J.

Marshall Bienstock is hosting an open forge in his shop at 7 pm almost every Monday night (Please call ahead on holidays to make sure , (732)780-0871)

Open Forge in Long Island

Sunday from 10:00 am to 6pm.
Starting the 1st Sunday in November until the end of April. Please call ahead to confirm and get directions. Ron Grabowski, 110 Burlington Blvd. Smithtown, NY (631) 265-1564
Ronsforge@aol.com

Business Members

We would like to thank those who joined with our new Business Membership category .
Business dues are $40
Please show them our support

John Chobrda, Dragon Run Forge
P.O. Box 315 Delaware City, DE, 19706
302-838-1960 jchob@verizon.net

Grant Clark, GWC Forge
PO Box 158 Perrineville NJ 08535
732 446-2638, 732 446-2638

Eric Cuper Artist Blacksmith
109 Lehman Lane, Neshanic Station, NJ 08853
908 642-6420 ericuper@msn.com

Bruce Hay, Jr.
50 Pine St., Lincroft, NJ 07738

Jayesh Shah, Architectural Iron Design
950 S. 2nd St., Plainfield, NJ 07063
jay@archirondesign.com

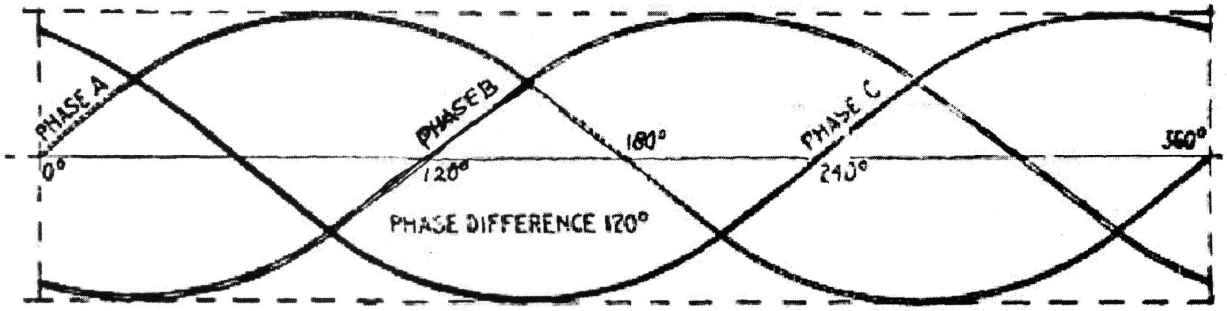
Louise Pezzi, Blacksmith
1241 Carpenter St
Philadelphia, PA 19147
215 336 6023 pezziandjr@gmail.com

Mark Balzarette, Blue Sun Customs LLC
124 Greenwood Ave. STE.C Suite C
Midland Park, NJ 07432

BLACKSMITH TOOLS FOR SALE!
John Chobrda
Has a large selection of tools for sale.
Anvils – Forges - Leg Vices—Blowers
Tongs – Hammers
and/or resurfaced Anvils
Call John for prices and availability
(302) 838-1960 cell (609) 610-3501

There are two more open forges now, see page 9. Thanks to the members who are doing this.

Don't be Phased by 3 phase!



3 phase power looks like the graph above. (more "pushes" in a given time period)

The main reasons for using the three phase power system are efficiency and economy, because three phase power is a very efficient form of electrical power distribution. All three wires carry the same current and have a constantly balanced power load. Three phase power flow begins in a power station. An electrical power generator converts mechanical power into alternating electric currents. After numerous conversions in the distribution and transmission network, the power is transformed into the standard mains voltage. At this point, the power may have already been split into single phases or into three phases.

Electric motors are the most common use for three phase power. A three phase induction motor combines high efficiency, a simple design and a high starting torque. Three phase electric motors are commonly used in industry for fans, blowers, pumps, compressors and many other kinds of motor driven equipment. A three phase power motor is less costly than a single phase motor of the same voltage and rating.

Three-phase has properties that make it very desirable in electric power systems and is the lowest phase order to exhibit all of these properties.

• The phase currents tend to cancel out one another, summing to zero in the case of a linear balanced load. This makes it possible to eliminate or reduce the size of the neutral conductor; all the phase conductors carry the same current and so can be the same size, for a balanced load.

• Power transfer into a linear balanced load is constant, which helps to reduce generator and motor vibrations.

- Three-phase systems can produce a magnetic field that rotates in a specified direction, which simplifies the design of electric motors.
-

Occasionally the advantages of three-phase motors make it worthwhile to convert single-phase power to three-phase. Small customers, such as blacksmiths or farmers, may not have access to a three-phase supply, or may not want to pay for the extra co$t of a three-phase service, but may still wish to use three-phase equipment. Such converters may also allow the frequency to be varied allowing speed control.

Because single-phase power goes to zero at each moment that the voltage crosses zero but three-phase delivers power continuously, any such converter must have a way to store energy for the necessary fraction of a second. One method often attempted is with a device referred to as a static phase converter. This method of running three-phase equipment is commonly attempted with motor loads though it only supplies Z/3 power and can cause the motor loads to run hot and in some cases overheat. This method does not work when sensitive circuitry is involved such as CNC devices, or in induction and rectifier-type loads. Some devices are made which create an imitation three-phase from three-wire single-phase supplies. This is done by creating a third "sub phase" between the two live conductors, resulting in a phase separation of 180° - 90° = 90°. Many three phase devices can run on this configuration, but at lower efficiency.

Steve Smith sent us the following article to help us understand conversion options:

Running Three Phase Motors on Single Phase Power by Steve Smith

If you're a good scrounge that reads the ads, goes to auctions and crawls over unique items in the dump, you've no doubt come across machines with three phase motors. Since most people don't have three phase power, the machinery or motors often sell cheaply. By building a phase converter for your shop, you can use three phase equipment directly. If your converter is a properly adjusted rotary converter, you can use the equipment at pretty much full rated horsepower.

This is a brief article and won't give you a detailed plan. Hopefully it will explain the basics of phase converters and give you enough references to allow you to build one on your own. I'll be happy to help however I can in your converter project.

Building a phase converter requires working with 240VAC power wiring. Be sure your skills are up to doing so safely.

About Motors

Three phase motors are pretty simple, just three sets of motor windings on an armature. Three phase power automatically pushes the motor in one direction; the motor will start with no help in the same direction every time. You can reverse the direction by swapping any two of the three wires.

Single phase motors are more complex. With only a single phase, the motor doesn't have a preferred direction. Apply power to the motor windings and it will not move (it will also make some smoke). Single phase motors need a "start circuit"; the start circuit gives the motor a push in one direction. Once the motor is turning fast enough, it will keep turning under power. The start circuit usually has a centripetal switch to disconnect it after the motor is up to speed (the most common type of start circuit). The start circuit also includes a large `start' capacitor, typically mounted on the side of the motor.

Three Phase Motors on Single Phase Power

There are two issues with running a three phase motor on single phase power, starting the motor and powering the third terminal.

Starting -If you spin the shaft of a three phase motor fast enough (some fraction of its rated RPM) and connect single phase power to two of the three motor windings, it will continue running under power.

Running on Single Phase-Powering the Third Wire -You don't have to power the third terminal. If you apply power to two out of three terminals on the motor, you're only running current through 2/3 of the motor windings, so you only have 2/3 of the motor horsepower available. If you try to pull out more power, you will over-current the windings and let the magic smoke out. In addition, a bare bones setup like this will vibrate and make some noise.
An external "idler" motor connected in parallel with your machine's 3 phase motor will cause current to flow in the third terminal (once you get through starting). Adding capacitors between the three motor terminals will balance the voltages. You can't get it perfectly balanced under all conditions, but you can get close enough for all practical purposes.

Phase Converters

There are a variety of ways to set up a phase converter.

Static Phase Converter -You can buy something called a static phase converter. All it consists of is a start switch and a start capacitor. You don't get much inside the box for what they cost. Very simple to make, all that a static converter does is provide a means to start your machine's three phase motor. A static converter will only allow 2/3 of the rated horsepower to be used in the machine.

Rotary Phase Converter -As mentioned earlier, if you have a way to start your machine spinning fast enough, you don't necessarily need a phase converter. This limits you in how much power your motor has, and it may rattle and groan a bit due to the unbalanced voltages. This is a static phase converter. To turn a static converter into a rotary converter, all you need to do is add an idler motor in parallel with the machine motor.

Adding capacitors across the motor windings helps balance the three voltages and the winding currents. This has several benefits:
1. Carefully balanced, you can get 90-95% of the rated HP from a three phase machine on single phase power.

2. No more moaning and groaning, much quieter operation.

3. Much lower current from your power meter, more efficient operation (something like a 7:1 reduction in current)

4. Much lower currents in the motor windings, lower temperature and longer motor life.
There are various setups people use for run capacitors. Some recommend putting all the capacitance on one side, others recommend a balanced approach. I like the balanced approach that

Fitch Williams came up with on the internet news group rec. crafts. metalworking. His approach is simple to do:
1. Measure the motor winding currents with no capacitors.

2. Add capacitance between all windings equally (1-2, 1-3, 2-3) and see if the current goes down.

3. Keep adding capacitors incrementally until you find the lowest current.
Note: if you go past this point, increasing capacitance increases current, so don't take huge steps. You're looking for the low point.

If you don't have a way to measure current, you can get pretty close by balancing the three voltages. Lacking a way to measure voltage, just scale your converter capacitors off of someone's article. If your idler motor is 'h the size of the idler in a published setup, use half the run capacitance.

IMPORTANT NOTE ABOUT CAPACITORS: All types of capacitors are not created equal.

Start capacitors are electrolytic type. They are only intended for intermittent use. Under continuous use they will overheat and burst. Do NOT use start capacitors for the run capacitors discussed above. You need oil filled capacitors for run capacitors. The voltage rating should be at least 330VAC.

Surplus/used oil filled capacitors are pretty readily available and recommended. Surplus/used start capacitors are a bad buy-an electrolytic capacitor has a limited lifetime. Buy surplus or used oil filled capacitors but buy new start capacitors.

Problem areas

Some machines, especially CNC machine tools, will have a mix of three phase and single phase circuits. It will work best if you arrange your wiring so that the single phase circuits are run off the incoming line voltage, rather than the generated phase.

References

A key reference for all aspects of building a phase converter is an article by Jim Hanrahan:
http:// www.metalwebnews.com/howto/ph-conv/ph-conv.html
Fitch William's approach to adding run capacitance:
http://tiny.cc/FitchConverter

There is a lot of information available on the web. Don't get too bogged down in the details. Hopefully I haven't made any mistakes; very likely I've left something out. Please ask if you have questions.

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