

Metal Casting
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One of the measures of a civilization is its ability to produce, refine and work metal into useful objects. For thousands of years, peoples have possessed some degree of metal working capability.

In the 1600s it was discovered that by heating wrought iron with carbon in a vacuum, steel could be produced. For approximately 250 years the same process dominated steel industry and the industrial revolution took off. With steel available for rails, locomotives, bridges and machines, the economically developed countries moved forward in a surge of industrialization that has continued ever since.

As with many other processes that we depend on, the production of steel and other refined metals has become tied to a sophisticated logistics network subject to the fate of our economic, transportation and governmental systems. Under certain circumstances the availability of raw metal for construction or machining could become non-existent.

One of the skills I have acquired and use regularly is welding, where a source of new or good used steel is necessary to fabricate or repair needed equipment. I have often wondered where I would obtain this material in the event of a war, economic or government collapse or other disaster.

While stationed in Korea in the U.S. Army, I had the opportunity to observe a small foundry in the village near my base. The operators take scrap steel and iron, melt it down and recast it into useful products. Though their equipment is old, they still seem to make a good living from it and do a lot of casting. It occurred to me that by using more modern technology available in the states this could become a small cottage industry capable of helping support a self-sufficient survivalist community.

By recycling aluminum, copper, brass or other useful metals, a community could support itself, provide a service, and do casting for its own needs. These castings can be machined to make replacements for parts that wear out or break.

While building a large foundry is beyond the reach of most groups or individuals, casting can be done on a small scale with a reasonable investment. To a group seeking ways to become more self-reliant it could be a profitable way to supplement community income.

Although I have personally cast small amounts of metal using an oxyacetylene torch, to be profitable a much larger furnace is needed. Many types of furnaces are available for melting metal: oil, gas, electric and coal and coke fired.

Because coal is available in most areas of the country I believe this type of furnace would be the most suitable for a survivalist community. Coke is the product left, which is mainly fixed carbon and ash, produced by coking-heating bituminous coal in the absence of air to 1,200° to 1,400° C. and expelling the volatile matter. Coke produces the temperatures necessary to melt and refine steel. To refine aluminum, brass and other non-ferrous metals coal or gas would be sufficient. Waste heat from the foundry could also be used to produce electricity or heat other buildings.

Most non-ferrous metals melt below 2,000° F. and can be liquefied by heat alone. Steel and iron must be heated 2,700° F. to liquefy and must be shielded to keep out contamination. This is usually accomplished by adding limestone to the fuel and metal charge, the limestone melts and floats on top of the steel, keeping air out of it.

While it would be impractical for a small community to build a foundry capable of melting tons of metal at a time, it should be possible for skilled individuals to construct one capable of handling a few hundred pounds.

The type of metal that will be worked determines what type of furnace will be needed. If only non-ferrous (little or no iron) metals are to be cast, a crucible furnace will be sufficient. In this type of furnace the metal is loaded into the crucible and the heat is applied

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to the outside of the crucible. Once the metal is liquid the crucible is either removed from the furnace and the metal poured or the crucible is tapped and the metal flows from the bottom into molds. If steel or iron will be processed it will be necessary to have a cupola type furnace.

This is basically a miniature blast furnace where the metal, fuel and flux are stacked in layers and a blast of air is blown through to superheat the charge. The liquid metal falls down into a chamber which can be tapped the same as with the crucible.

There are many sources for foundry related materials but most of the exterior of the furnace can be constructed with materials scrounged from scrapyards. Refractory material (the liner of the furnace), crucibles, and ready-made molds will be major expenses but as you become experienced you can make your own molds.

Because of the extreme temperatures of molten metal the use of safety equipment must be emphasized. Heavy protective suits, gloves and boots protect against molten metal or dropped objects. The eyes have to be shielded from thermal radiation by goggles or hoods.

Before beginning this article I was under the impression that construction of a small foundry would be complicated and costly. After seeing the small foundry near my base and researching publications on this subject I believe that it would be possible to construct a decent sized operation using mostly scrap materials. There are costs involved, of course, but spread among the resources of a community, a small operation is feasible and for a community striving for self sufficiency, probably necessary.

An excellent source of information on metal casting for the beginner is:

The Metalcasters Bible, published by TAB Books,
Blue Ridge Summit, PA 17214.

For additional reference material on metal casting and many other subjects, your local public library is a good place to start looking.