

Chapter 3—Charcoal

Description of the Product and Its Uses

Charcoal, a form of amorphous carbon, is produced when wood, peat, bones, cellulose, or other carbonaceous substances are heated with little or no air present. A highly porous residue of microcrystalline graphite remains.

Charcoal is a fuel and was used in blast furnaces until the advent of coke. Today most charcoal is used for recreational, restaurant, and home cooking in the form of charcoal briquettes. A small amount of charcoal is used in certain metallurgical processes and as a filter to remove organic compounds such as chlorine, gasoline, pesticides, and other toxic chemicals from water and air.

In 1961, the Forest Service counted nearly 2,000 charcoal-producing units in the United States, including brick kilns, concrete and masonry block kilns, sheet steel kilns, and retorts and ovens. Ninety-four percent of these were in the eastern United States and accounted for 98 percent of the Nation's charcoal production (Baker, 1985). Much of the lump charcoal produced today is produced in Missouri, where many manufacturers operate small kilns or retorts.

In States like Missouri, about 90 percent of the charcoal produced is made from sawmill slabs and edging strips, residue left from the manufacture of lumber, railroad ties, blocking, and other rough products. The charcoal market is very important to the sawmill operator because there is no other way to get rid of this material (which can become a fire hazard), since it is illegal to burn it in the open. It also accumulates rapidly: a circular sawmill in the Ozarks produces about a ton of slabs and edgings for every 1,000 board feet of lumber sawn. (This is a rough rule of thumb and varies according to the type of mill, products sawn, etc.) Some small mill owners depend on selling bundles of slabwood to the charcoal industry to sustain their sawmill operations when lumber prices are down. The remaining 10 percent of the charcoal produced comes from small roundwood or cordwood from forest thinnings (Bob Massengale, personal communication with author).

While charcoal can be made from any substance with high carbon content (including peat, bones, cellulose, nut

shells, vines, or any number of natural materials common to forests), native hardwoods such as hickory, mesquite, oak, maple, and fruitwoods such as apple that have natural aromas are among the most popular materials for lump charcoal. For most uses, the better grades of charcoal come from raw materials with low sulfur content.

Before the advent of briquettes, charcoal was used in lump form, often screened to remove pieces smaller than one-half inch. This practice left behind a large volume of unusable fines. It was the accumulation of charcoal fines, the desire to produce a uniformly sized product with uniform burning rates, and the need to supply a cleaner product for home and recreational markets that led to the production of charcoal briquettes.

The process of making briquettes consists of dry-grinding the charcoal and mixing it with a starch solution to form a paste. In addition to the charcoal and starch, various amounts of coal, clay, and char from lignite or agricultural residues are used in the briquettes. The paste then goes to a double-roll rotary press, which delivers formed briquettes to a continuous dryer.

Activated charcoal is a highly porous form made by heating charcoal in a steam furnace to 1,800°F. The process results in a type of microscopic sponge—particles honeycombed with chambers that trap molecules of contaminants. Finely ground activated charcoal has a great deal of adsorptive surface: 1 ounce has a surface area equivalent to 6 football fields, and the same amount of superactivated charcoal has a surface area equal to 22 football fields.

The uses for activated charcoal have been multiplying in recent years. It is used for adsorption in refining processes and in gas masks. The brass and copper industries use activated charcoal for purifying metals. NutraSweet uses activated charcoal to change the substance from a yellow-sticky to a white-flaky consistency. Activated charcoal is a valuable antidote for many types of poison: its surface locks onto the surface of other substances, such as poison molecules, and thereby allows the poison to be moved safely through the digestive tract. There are some 700 applications of this type of charcoal. Finally, miscellaneous uses of charcoal include thermal insulation, a drawing medium for artists, a health remedy, and a substitute for lime in soil additives.

Market and Competition Considerations

Most producers of charcoal sell their product to be made into briquettes, generally to intermediary operations, such as Standard Milling in Kansas City, which process the charcoal either for briquette manufacturers, such as Kingsford, or other more specialized industrial uses.

The market for briquette charcoal has been dominated by a few “heavy hitters” of the industry such as Kingsford, Embers, and Royal Oak. As an alternative to charcoal briquettes, some small producers of lump charcoal are beginning to market their product directly to homeowners. Lump charcoal does have some advantages over briquettes. It is an all-natural, 100 percent hardwood product, without the additives that are used to make briquettes. Natural charcoal heats faster than briquettes, so food can be cooked over natural charcoal as soon as the charcoal begins generating heat, usually within 5 to 7 minutes after lighting it. Because there are no binders, lump charcoal can be lit with just a match and a piece of newspaper. This eliminates the need for lighter fluid, the burning of which can impart taste to food. The fact that natural charcoal can be easily ignited allows users to start with a small amount and add to the pile as more heat is needed. Natural charcoal can be smothered by closing off the air supply or putting it out with water, then reused at a later time. Finally, hardwood charcoal producers generally claim that natural hardwood charcoal retains heat longer than briquette charcoal, and that it is a more efficient fuel: 1 pound of hardwood charcoal produces heat roughly equivalent to 2 pounds of briquette charcoal.

However, consumer demand for natural hardwood charcoal is still limited. A major obstacle to wider charcoal use has been cost. Under current systems of production, natural hardwood charcoal is roughly twice the price of briquettes per pound, and because natural charcoal is lighter than briquettes, the consumer must store a greater volume of it to have the same number of pounds. It is also a bulkier product than briquettes because of its odd shapes and crushes more easily than briquettes. Therefore it is harder to package lump charcoal. Natural charcoal is a little harder to cook with because it heats hotter, which makes it easy to sear food rather than cook it. It also tends to become dusty and “flake off,” whereas the briquette is a more compressed, dense product and has a longer burn.

Any entrepreneur hoping to make it big in the charcoal industry is probably not being realistic. Still, there appears to be some modest potential for local niche markets for natural hardwood charcoal. Tapping this

market requires originality and very good, aggressive marketing.

But charcoal is a product that seems to lend itself to innovative marketing. Many small companies have succeeded with unique ideas related to charcoal products. For example, a small company recently developed a box containing charcoal briquettes and a fuse. The user lights the fuse, which ignites the box, which in turn ignites the briquettes. According to the Barbecue Industry Association, this product is probably going to be very successful. Another example is the new “quick light” product which is really nothing more than some briquettes sprayed or dipped in paraffin wax and perhaps with a little mineral spirits also, packaged in a 2-pound bag for the “use once” market. The bags usually have a vapor barrier to prevent volatiles from evaporating. If the bag is opened or torn, the “quick light” effect is lost.

There is also a possible market for other charcoal uses. Entrepreneurs would also do well to consider other charcoal products such as high-grade filter charcoal, used for air-filtration and water-filtration systems. Wood charcoal, unlike charcoal made from coal or petroleum products, contains little sulfur. Because of this, it can be used for air pollution control or drinking water filtration. To make high-grade filter charcoal, very small cells are needed. This can be produced from a very dense wood without many extractives. In the past, the biggest competition has come from coconut shell charcoal, but special burners now exist to bring certain native woods to within a purity comparable to that achieved with coconut shell charcoal, and much cheaper. For instance, manzanita is a fine-grain dense wood that makes superior charcoal for filtration.

Charcoal dust is also beginning to be used to mark foods for certain uses, such as pet food, while still in the slaughterhouse. It is used for hardening steel by packing the steel in charcoal dust. It can be used as a substitute for lime because of the high potash content and could be a little cheaper than lime.

Filter charcoal may also become a growth market. Calgon Carbon of Pittsburgh is one of the world’s largest producers of activated carbon. The company earned \$38 million on \$285 million in sales in 1990, with a 19-percent gain in annual sales growth. One of the most important growth markets for filtered charcoal is with municipalities. Cities use filtered charcoal to remove chemicals, heavy metals, and other materials from the leachate from landfills. Filtered charcoal is currently expensive and has a one-time use: once loaded up with pollutants it is hard to dispose of it. But an entrepreneur selling lump charcoal to a large manufacturer of filtered charcoal should investigate this market.

Distribution and Packaging Considerations

For those who manufacture raw charcoal for sale to larger processors, distribution is simply a matter of identifying the nearest such milling operation and determining their requirements for the charcoal they receive. But distribution becomes a large factor for the small manufacturer who is trying to market lump charcoal or smokewood direct to stores. Small producers cannot generally use food brokers because the volume brokers require is generally beyond the production capacity of a small manufacturer. Either distributors must be found who will handle fairly small quantities, or the manufacturer must do the distributing himself or herself. This presents a challenge, since competition from the large briquette producers such as Kingsford Company is keen.

Transportation costs must be carefully assessed, since charcoal is charged by weight and can be quite expensive. Small manufacturers looking to market and distribute their product themselves would be advised to look first at their local and regional markets such as grocery store chains. They must be prepared to spend time “knocking on doors,” getting to the right people in stores, and making a good sales pitch. In many cases, cooking demonstrations can be the most effective sales pitch, since people are impressed when they discover how easy it is to light natural charcoal and how quickly one can cook over it.

Charcoal producers who choose to package and distribute their charcoal themselves need to pay great attention to packaging. Unfortunately, the virtues of the good old-fashioned, environmentally safe bag generally do not overcome their drawbacks in today’s competitive environment. The presentation of items in modern supermarkets is tremendously important in determining sales, and most owners and managers of grocery stores, liquor stores, and other retail outlets that would sell charcoal are not good at promoting products in “plain brown bags.” Too often, the plain packaged items end up on the bottom shelf in the back of the store, where people don’t see them.

In addition to visual appeal, paper packaging has another serious drawback. Failure to use polyethylene-lined or otherwise moisture-proof bags can mean disaster if the charcoal is stored for any length of time in a humid environment. If a paper bag sits in an unheated warehouse in a humid area, it can absorb enough moisture to weaken to the point of bursting. Having a 12-pound bag of charcoal break in a shopping cart does not improve the image of a product. There are definitely drawbacks to using attractively printed polyethylene bags: they are expensive and they are not biodegradable.

Some producers of hardwood charcoal are selling their product in plastic bags, which are not only waterproof and cleaner and handier than paper but also take advantage of the fact that hardwood charcoal provides something different in looks—the pieces are irregular and some are marked with the wood grain. The plastic bag packaging allows the buyer to see this difference. Wording and graphics on the package that emphasize the natural aspects of hardwood charcoal are also appealing to consumers.

Equipment Needs, Costs, and Suppliers

In addition to the raw materials to be used (whether wood or another carbon-based substance), an enclosed area is needed that is suitable for heating the material while allowing only the most minimal amount of air circulation. Some manufacturers make use of brick kilns, approximately 25 feet high and 30 feet in diameter. A kiln of this size has an annual production capacity of about 550 tons. There is some technique involved in knowing how to stoke the fire (by poking a steel rod in the vents of the kiln) and knowing how long to cook the charcoal. Such skills are not highly technical, but there is some element of folklore in how these skills are passed along.

Other charcoal producers use a type of retort, a metal enclosure which is often just a simple sheet-metal building. An entrepreneur could expect to pay between \$40,000 and \$80,000 for a retort, depending on design and how much of one’s own labor the entrepreneur wished to put into building it. Various designs are available.

In addition to a kiln or retort, a sorting and crushing operation, as well as a bagging operation is necessary to market the charcoal. When the charcoal comes out of the retort, it is smaller than the original pieces of slab wood by about one-third, but it is not very broken. It must be broken down into marketable pieces, and this must be done in such a way so as not to generate too much dust. The pieces must be bagged and the bag sealed.

The retort and small-scale sorting and crushing equipment would likely either have to be made by a company that specialized in made-to-order machinery or made by the operator. Companies that work with the aggregate industry might be a good source of assistance. Bagging machines are readily available from bagging equipment supply companies. Because of the large variance in sizes of pieces, charcoal presents a bit of a problem but there are ways around this. An automatic bagging line could cost anywhere from \$15,000 to \$250,000.

Assuming a person was good with his or her hands and tools, the total start-up operation for charcoal production could begin at around \$100,000 in equipment.

To get into the activated charcoal market would require much more expensive equipment. One of the newest pieces of equipment to produce high-grade filter charcoal is a clean smoke burner. This product, in the \$70,000 range, takes roundwood (not chips) and burns it very efficiently. The Kleensmoke Inverse Pile Burning System, for example, also makes usable heat which can fire a boiler or be used for drying wood, lumber, or other products. Income from the heat generated could lower the cost of the charcoal produced.

Resource Conservation Considerations

The charcoal industry should be aware of air quality standards and requirements. The charcoal industry has been watching closely a review of air quality regulations which allow operation of Missouri-type charcoal kilns under a variance from standard emission levels. Recent actions by the Missouri Department of Natural Resources seek changes in the process weight rules, new definition of kilns, and clarification of repairs and alterations to kilns.

Profile

Mr. Earl Englebrecht is the owner of a small charcoal company in the small town of Gladwin, Michigan, located about 3 hours from Detroit. He entered the business after being laid off as an engineer at age 57. He heard of the company Sugartown Products, Inc. that had been in business for over 25 years and that had been started by a retired Dow Chemical engineer looking for retirement income. This individual had been a maintenance welding engineer for Dow Chemical for several years, and one area of his expertise (in addition to the welding) was the maintenance of the charcoal plant that Dow Chemical owned in Michigan's Upper Peninsula. As a result of that knowledge, the original owner had designed and built a number of retorts and had started selling what he produced. It was primarily sold in local markets, though there were a couple of outlets in Detroit and a couple in Ann Arbor too.

At the time Mr. Englebrecht bought the company, the business had about 80 customers. As a toolmaker, Mr. Englebrecht had the mechanical background needed to run the facility and not have to rely on outside maintenance people. In a few years, the business had grown to over 200 customers. In 1991, the market was down because of the recession. Nevertheless, gross earnings are projected at \$40,000 to \$45,000.

Mr. Englebrecht uses mixed hardwoods to make his charcoal. No foreign additives are used. He weighs and packs the charcoal into 10-pound bags using a bagging machine. A 10-pound bag retails between \$5 and \$7, depending on the locale. He will soon begin marketing a 2-pound bag as well and has plans to build a second retort. This will also allow him to expand his marketing into other parts of Michigan. He is also looking for uses of charcoal beyond barbecuing.

Using just one retort, Sugartown Products produces about 220,000 pounds of charcoal. The design of the retort is original and accounts for its high productivity.

The briquette marketing business has been done so thoroughly and has so well ingrained people that when you say 'charcoal,' they automatically think of briquettes. We have an education problem to acquaint people with lump charcoal and how to use it. But once people get accustomed to using it, they will use it year-round. Some have even converted back from propane gas grills because they can taste the propane. Used properly, a 10-pound bag of charcoal will last longer than a 20-pound bag of briquettes.

Considerations for a Rural Development Strategy

Small charcoal producers could conceivably sell natural charcoal as a replacement for briquettes if they look to a local or regional market rather than a national market, and if they could make several products using their chipper. Another good strategy is to link up with a grill company or otherwise sell the product to a large company that can afford to do the marketing.

Another strategy, not specific to charcoal, would be to develop a combination retail and leased space grocery store for regional products. Instead of having buyers choose which products to buy and display, small entrepreneurs selling items for general household use would lease small amounts of store space. This would benefit small entrepreneurs who have been "locked out" of the grocery store market by the big food companies that are the only ones that can afford to pay the slotting fees and produce enough volume to compete in our current food distribution system.

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Equipment Suppliers

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