



# Charcoal

A Value Added  
Opportunity for  
Wood Handlers

**Virginia  
Cooperative  
Extension**



 **Virginia Tech**  
*Invent the Future*  
[www.ext.vt.edu](http://www.ext.vt.edu)

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# Market Niche for Lump Coal

...Sales of lump charcoal have more than quadrupled in the past 7 years and more than **doubled since 1998**. About 91,000 tons were sold in 2002, up 9.64% from the year before. While lump charcoal still accounts only for about one-tenth the amount of traditional pillow-shaped briquettes sold annually, it is definitely an exciting trend for lump processors...

USDA Forest Service, June 2003, *Forest Products Conservation & Recycling Review*

# Outline

- History
- How To
- Economics
- Marketing
- Considerations
  - legal



Three Forms (Pyramid, Sphere, Cube)

David Nash, Artist

# Briquettes VS. Real (lump/natural)

## Briquettes

- Orin F. Stafford & Henry Ford
- Sawdust & stuff
  - Binders (starch)
  - Paraffin or petroleum
  - Limestone to color ash



## Real

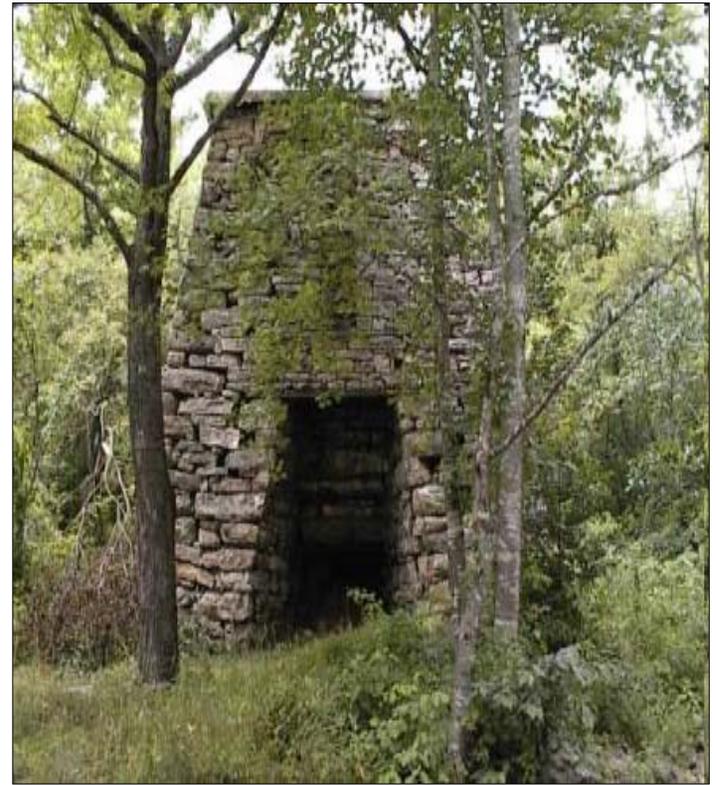
- Since fire was discovered
- Charred wood



# Charcoal History

## US pig-iron Industry

- An average furnace would consume from 600-800 bushels of charcoal every 24 hours. This required about 30-40 cords of wood from trees 25-30 years old.
- 8 cords of wood to for one ton of pig iron.
- One iron season (summer) would consume 4,428 cords of wood a year
  - 150 acres of woodlands each year.
  - 5 furnaces in Massanutten area > 750 acres/year.
  - In a 30 year “cycle” 19,000 and 23,000 acres of forest had been clear-cut in continuous bands.



# Back in the day...



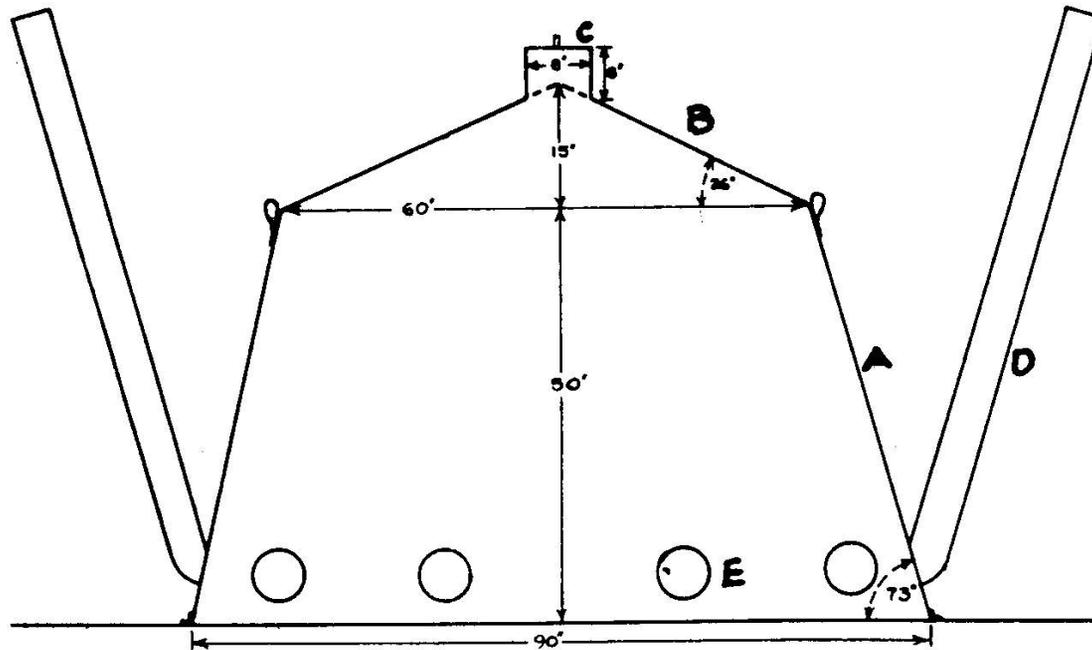
# Today

Two methods: Indirect and Direct

- Indirect: “cook” the wood with an external fuel and “reburn” (retort) the gases.
  - Less skill required, higher yield, less smoke
- Direct: heat is direct from the fuel being charred. Can also retort to reduce smoke.
  - The original method
  - Less complicated kiln
  - Low oxygen burn, controlled oxygen

# Portable metal kilns

- Ancient technology “mastered” in 1930s



# Portable metal kilns

Modern version  
(modified New-Hampshire style kiln)



# Portable metal kilns: Fabrication

- Specifications/goals
  - Portable – transport on full size pickup
  - Inexpensive – materials cost under \$500 - \$1000
  - Minimal – tools/skill/time needed for fabrication



# Kiln operation

- 48-72 hours production time
  - Unattended overnight / low maint. daytime
  - One person operation during most of production
- Nontechnical
  - Load, light, and “leave it alone”
- Safe
  - Minimal fire hazard, risk to operator, loss of product, etc.
- Ideal for multiple kiln operation
  - One-half to two-thirds cord of wood per batch
  - Yields 200 – 300 lb marketable charcoal

# Photo-torial



# Air-dry wood



# Kindling in the middle



# Load it, tight



# Seal it



- Caulking (high temp)
- Sand
- Dirt
- Foil tape

# Light it



# Add stacks



“Burn” the volatiles, reduce oxygen,  
*watch the smoke*



# After ~ 20 hrs

- Close
- Seal every air gap
- Let it sit for at least 24 hours.
  - 48 hrs. better
- Be sure it's cool before opening



# Take off the top





# Sorting





Product: The best darned BBQ fuel



# Rules for making charcoal:

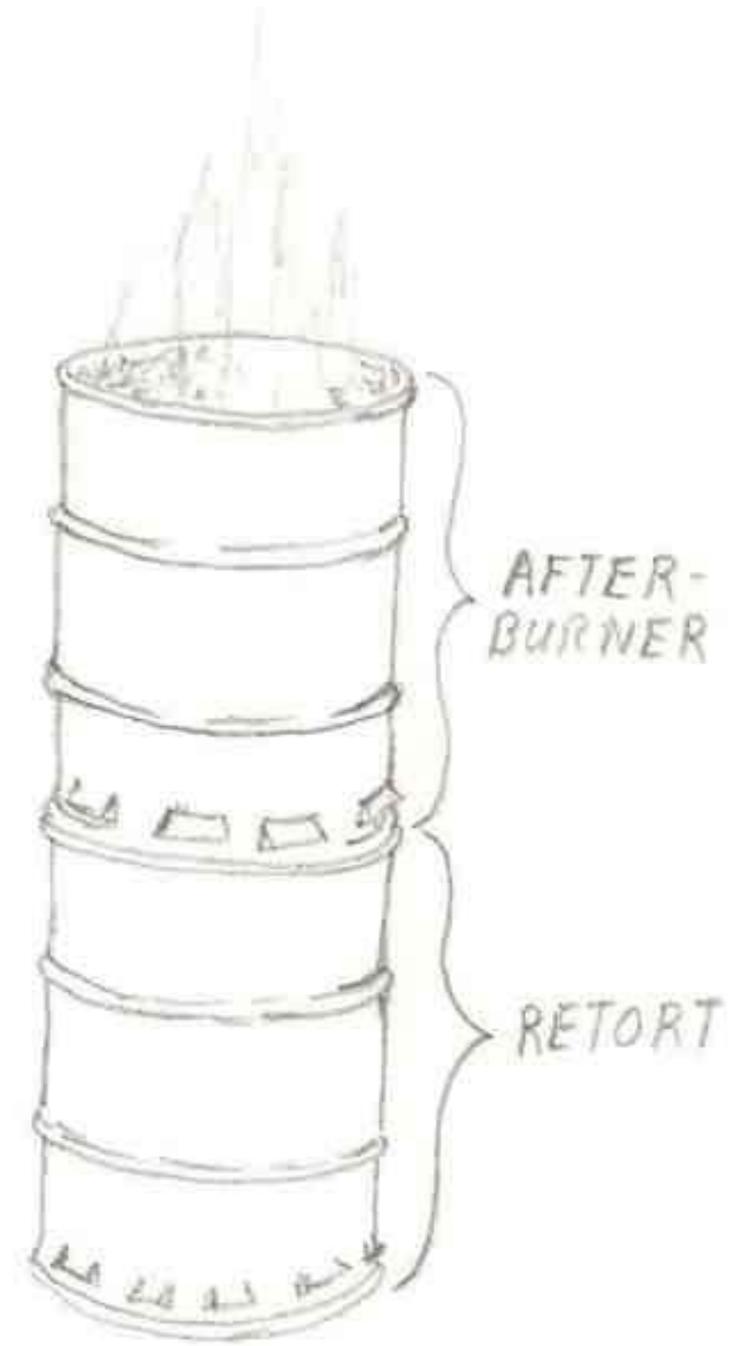
from Gary Gilmore, PA-DCNR Forester



1. Don't waste your time using green wood. GREEN WOOD MAKES LOTS OF SMOKE AND VERY LITTLE CHARCOAL!
2. Don't aggravate your neighbors by smoking them out. Use an afterburner or go somewhere where no one will mind the smoke.
3. Don't use treated or painted wood for charcoal if you are going cook with it. Chemicals will remain in the charcoal and **WILL** poison you.
4. Don't put freshly made charcoal in a container that will burn or in a building that could burn.
5. Don't try this inside!!!!
6. If you don't have enough common sense to be careful with fire and you want to blame me for your mistakes, **DON'T make charcoal**. Go play a game of golf or watch TV.

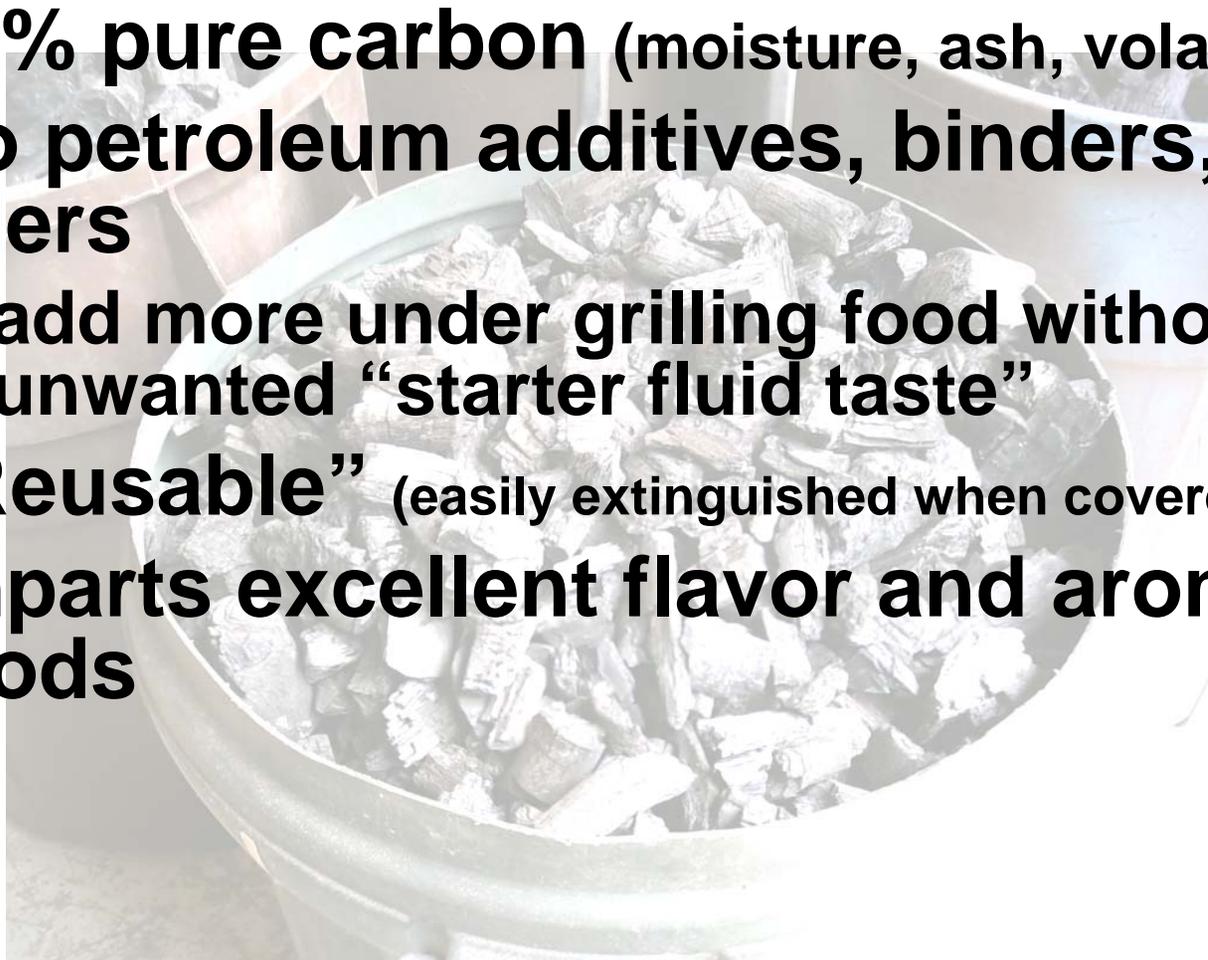
<http://www.puffergas.com/terra/rules/rules.html>

# Puffergas...



# Product: Natural Hardwood Charcoal

- **90% pure carbon** (moisture, ash, volatiles)
- **No petroleum additives, binders, or fillers**
  - add more under grilling food without unwanted “starter fluid taste”
- **“Reusable”** (easily extinguished when covered)
- **Imparts excellent flavor and aroma to foods**



# How to use it

- Use a “chimney” to light charcoal
- Lights fast (5-10 min)
- Burns clean, hot, long (600°, 25-45 minutes)
- Can add more charcoal directly
- Sensitive to oxygen
- Low ash build-up



# Economics - “Black Gold?”

- Cost of raw material = \$0.00
  - Stuff that’s not even good for firewood
- Think of this as a down-time filler
  - Great winter work
- Sell firewood & charcoal

[Cost worksheet.xls](#)

# Firewood Comparison

Figuring ½ cord of firewood (2'x4'x8')	
Sells for ~ \$75.00 cut, dried and stacked	Value as charcoal ~ \$234.00 bagged
Costs: labor ~ 3 hrs. ?(\$30.00)	Costs: Labor & bags ~\$150.00 (13 hrs. + bags)
“Profit” ~ \$45 (150%)	“Profit” ~ \$84 (180%)
Additional costs = delivery, drying time, saw, splitter, etc.	Kiln ~ \$2000.00 Bag closer ~ \$400.00 Other materials ~ \$30.00

# Other angles

- Do you pay to get rid of wood?
- Retail value of 1 ton charcoal = \$1000
- Firewood delivered 1 ton = \$60
- Charcoal is about  $\frac{1}{4}$  the weight



# Marketing Ideas

- Farmers Markets: *Local Fuel for Local Food*
  - Local markets & brands
- Tailgaters
- BBQ events
- Demos at festivals
- Bulk to restaurants & caterers



- Applying for



# Additional Considerations

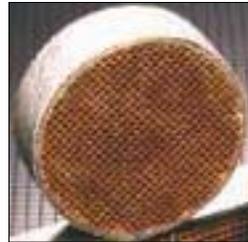
- Legal
  - Burning ordinances
  - Bring waste wood “home”
- Waste
  - Fines... are they waste or “bio-char”?
- Smoke

# Smoke

- A big deal depending where you are
  - May not be permissible without permit in some areas
  - Reduce smoke with catalytic converter
  - Be considerate of neighbors
  - EPA research shows charcoal making smoke less polluting than open burning.
- Check with authorities
- <http://www.deq.state.va.us/air/regulations/airregs.html>

# Work in Progress

- Cost Revenue Analysis
- Bio-char utilization
- Emission-free operation
  - Catalytic conversion
  - After-burners
- New producer support
  - Kiln loan



# Acknowledgements

- Virginia DOF – Charlie Becker
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- USDA Forest Service



**VIRGINIA TECH**  
**FORESTRY**



# Are you Green Grillin'?

[www.forestry.vt.edu/charcoal](http://www.forestry.vt.edu/charcoal)

