Heating With Wood 2.0

Thinking it through

Franklin Cobos II

Overview

- How Much of it?
- Sourcing Your Wood and Hauling it
  - Your property vs. Someone/somewhere else
- Handling It
  - [Chainsaws, Felling] Cutting, Splitting, Drying/Stacking/Storing
- Burning It
  - Inside vs. Outside, Catalytic vs. Non-catalytic

How Much?

- Energy Contents
  - Electricity: 3.4k BTU / KwHr = 0.12 $
  - Natural Gas: 1.04 BTU / ft^3 = 100K BTU / CCF
  - Propane: 91.5k BTU/gal = 3.50$
  - Kerosene: 132k BTU/gal = 4.50$
  - Heating Oil: 138k BTU/gal
    - *BTU = Heat needed to raise 1 lb of water 1 deg F

How Much?

- Useful Conversion Factors
  - 1 Therm (Natural gas) = 100k BTU = 29.3 Kwhr = 100 CCF of NG
  - 1 Kw hr = 3,412 BTUs
  - 1 cord of Oak wood ~ 25 million BTU (250 Therms)
  - 1 cord = 8’x8’x4’ = 128 ft^3
- My calculations
  - 1 Therm 7/2024 = 1.08$ = 29.3 Kwhr = 3.49$ of electric heat (.12$/hr)

My Wood Heat

- 1 Cord of wood
  - Oak (red) & Maple (sugar) = 25 Million BTU
  - Hickory = 27 Million BTU
  - Poplar - Pine = 10 - 16 Million BTU
    - * Approx 5% heat content decrease per year as wood decays (covered)

My Wood Heat

- I spent about 750$ in natural gas to heat without wood.
- I burnt about 3 cords of wood in a winter
- 3 cords = 75 million BTUs
  - How much NG do I have to buy to get the same heat content?
  - 3 cords = 937.50$. (~ 550 gal of Kerosene or Propane, 820 gal LP)
  - At 15$ / hr salary that’s 62.5 hours of labor (sourcing, splitting, stacking)

Sourcing & Hauling

- Your property
  - ~10 acres for renewable supply (species specific heat content)
  - Very near transport (smaller loads, smaller truck (hitch, 4WD) +/- trailer (? dump, tilt, low bed)
- Someone/somewhere else (larger loads, bigger truck and trailer)
  - Tree surgeon waste, friends with acreage, log delivery (cost benefit?), used/broken pallets & saw mill scraps (last resort)

[Handling It]

- Chainsaws & Tools
  - Gas, STIHL or Husquavarna, 16” minimum, 18” as second saw
    - Spare parts/saw (correct tools, pull cord/handle, spark plug, caged pilot bearing, C-clip, clutch springs?)
    - After each use: air compressor or brush cleaning, top off gas/oil,
    - When sharpening, inspect bar oil path, file the bar and flip it, clean the chain (before sharpening; nylon or brass brush)

[Handling It]

- Chainsaws & Tools
  - Annual Maintenance: Clean with Carb cleaner, Grease the caged bearing, fuel and air filters, spark plug.
  - End of season: Carburetor rebuild/replace, bar nuts. Mudslinger or Maxima SC1 silicone spray coat. Store “dry” (run it out of gas).
  - Eye/ear/leg protection, Cant hook, log jack.

[Handling It]

- Felling
  - Risk of killing yourself, others; crushing a vehicle or house.
  - Free felling vs. Controlled take down

Handling It

- Set up your homestead and plan your work flow so that you don’t have to pick the wood up unnecessarily over and over, again and again.
- Idealy, bring it to a place where you can saw logs, split the rounds, stack the splits, and later burn them, essentially at the same location (for an outside stove), or conveniently located near an entrance to the house.

Handling It

- Cutting
  - Think ahead about how pieces of wood will physically fit into the burn chamber.
  - Choose a length (measured front to back, or side to side length) and remain consistent (convenience & predictable burn times).

Handling It

- Splitting
  - Think ahead about how it’s going to physically fit into the burn chamber and plan accordingly
    - Choosing a thickness/shape
      - Traditional/pie shaped pieces
      - Rectangular

Handling It

- Splitting by hand (Are you serious?!)
  - Type of wood
    - Evergreens vs hardwoods
    - Dry, clean grain vs. wet, branches/knots
  - Time of year
    - Frozen wood in winter (cracks like glass) vs. recently live (wet and bounces like rubber)

Handling It

- Stacking, Drying & Storing
  - Under cover, air drying occurs ~1” per year (~ 2” total thickness, 1” from each exposed surface).
  - 6 months minimum, 9 months preferred, 12 months is best.
  - Measuring the moisture content - definitive answer.
  - Optional: drying inside the house

Burning It

- Inside
    - Pros: can be visually pleasing, great for socializing, can be used without electricity, more convenient to reload during harsh weather.
    - Cons: dirty (ash/soot, wood/bark), climb the roof to clean the chimney.

Burning It

- Outside
    - Pros: bigger capacity, can require less time for cutting, splitting (pieces are bigger), and stacking (One less place to carry the wood to a final spot inside before finally putting it in the burn chamber), often have options to generate hot water for bath and kitchen needs.
    - Cons: Cost, pumps need electricity to transfer the heat from outside to the house (air or fluid heat exchange), high maintenance (unless it’s forced air).

Burning It

- Catalytic
  - Pros: burn a LOT more efficiently (use less wood, i.e. less work to source and prepare it), burn hotter/longer, build up less soot in the chimney
  - Cons: are picky about moisture content, expensive, can be time consuming to maintain.

Burning It

- Non-catalytic
  - Pros: are generally less expensive, not at all picky about what they burn
  - Cons: are harder to clean/maintain because of more soot/smoke production, cannot burn as long with the same amount of wood (may not get you through a cold night).

My Stoves

- Indoor, catalytic
  - 5K$ with install in 2012
  - Up to 5 loads per day
  - Empty ashes Q4-6 days
  - Chimney & catalyst (3,000 holes cleaned yearly by hand with pipe cleaner)
  - 3 cord/year (384 cu ft (7.25’ cube)) Mostly hardwood
  - 2200 sq ft log home with minor drafts ~68-70 F.

My Stoves

- Outdoor, non-catalytic
  - 4-5K$ with installation 2022
  - 2-3 loads per day
  - Forced hot air (electric fan; 300 watts)
  - Empty ashes weekly
  - Chimney cleaned yearly
  - 2000 sq ft spec house, 72-78 deg.

My Stoves

- Outdoor catalytic (Central Boiler)
  - Cost including installation = $33,000
  - 2 loads per day
  - Approx 6 cords/year
  - Heats ~5,000 sq ft + provides hot water
  - 20-40 min cleaning every week
  - Fluid heat transfer (~3 kW/day; 2 circulation pumps + fans)

My Advice…