

# Laser Cutter

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July 14, 2018

# What is it?

- CNC (Computer Numerical Control) laser
- 600mm x 400mm working area (~24 x ~18)
- 80W Infrared Laser

# How does it work?

- Laser turns on
- Laser melts/burns/vaporizes very small patch of material
- Compressed air blows away the melted/burnt/vaporized material
- Basically the same as a plasma cutter/waterjet

# Laser Safety

- Really really bright!
  - Incandescing part may be very bright too
- Fumes are bad for you
  - Ensure ventilation is running properly
  - Check your materials (more on next slide)
- Fire may be involved
  - Do not walk away from cut job, part may catch on fire



# Materials

- Some materials cut really well on the laser
  - Hard wood, plywood, Acrylic (PMMA), Delrin (Acetal), Leather
- Many materials cut poorly on the laser
  - Plexiglass (PC), MDF, polyethelenes (HDPE, LDPE, UHMW), thin metals ( $<0.010''$ )
- Some materials can only be marked
  - Thick metal, granite, glass, fiberglass
- Many materials are DANGEROUS to cut

# Dangerous Materials

- CHLORINATED PLASTICS
  - PVC, corrugated sign material
  - Releases CHLORINE GAS when laser cut
  - Cutting these plastics will DESTROY YOUR LUNGS and DESTROY THE LASER CUTTER
- Cyanide-containing glues
  - Some types of MDF and Plywood, you have to check
  - Releases CYANIDE when laser cut
  - Cutting these materials will POISON YOU
- Pressure treated woods
  - It'll kill the bugs, and it's not good for you

# Materials

**KNOW** what you are cutting!

Check online for unfamiliar materials

# Process

1. Pick material
2. Find/make design
3. Open design in SmartCarve
4. Set process parameters
5. Prep machine
6. Perform test passes
7. Cut/engrave final design
8. Secure machine

# Pick Material

- Lowe's
  - Plywood, MDF
- Woodcraft
  - Nicer plywood
- Online Metals
  - Acrylic, Delrin
- McMaster-Carr
  - Acrylic, Delrin
- Others available

# Find/make design

- Account for material properties
- Account for laser cutter:
  - ~0.010-0.020" kerf
  - Sides won't be flat
- Desirable formats:
  - DXF
  - BMP
  - HPGL

# Formats - DXF

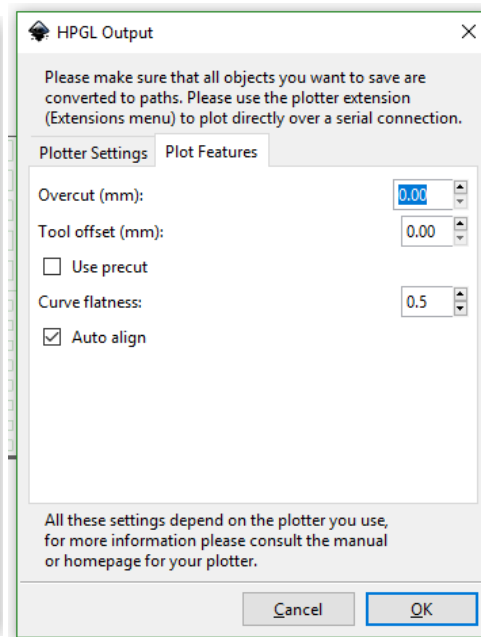
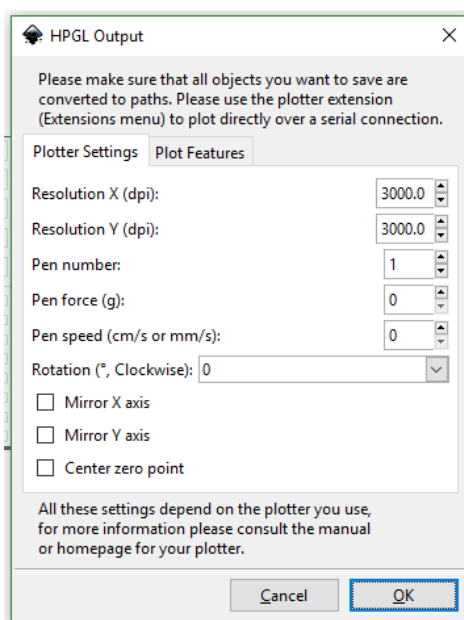
- Autodesk file format
- Good compatibility with SmartCarve from Autodesk software (Inventor, Fusion 360)
- Okay compatibility from other software
- May have scaling issues

# Formats - BMP

- Raster Image - Undesirable
- May have scaling issues
- BMP vs. JPG
  - JPG may have undesirable artifacts
- PNG
  - Convert to BMP first

# Formats - HPGL

- Used by plotters and drag knife cutters
- Exportable from Inkscape
  - If you have an SVG file, you can open it in Inkscape and export as HPGL



# Open design in SmartCarve

# Set process parameters

- Check wiki for laser cutter parameters for your material/process combo
- For new-to-Hacksburg materials, check online for cutting parameters and document successes on our wiki!

# Prep Machine

- Follow instructions on wiki
  - Turn on...
    - Computer
    - Wall switch
    - Power conditioner
    - Tube chiller/pump
    - Laser cutter (!!)
  - Load material
  - Set focus
  - Move to origin

# Perform Test Passes

- If you're not using a material/thickness/process combination you're familiar with, do a test cut to check you're getting what you want.

# Cut/Engrave Design

- Follow instructions on the wiki
  - Open window
  - Turn on...
    - Blower Fan
    - Air compressor
    - Laser tube
  - Set laser power dial to 100%
  - Ensure start location is correct
  - Start job on computer
  - Repeat as necessary

# Secure Machine

- Follow instructions on wiki:
  - Turn off...
    - Laser tube
    - Blower fan
    - Air compressor
    - Laser cutter
    - Chiller/pump
    - Power conditioner
    - Wall switch
    - Computer
  - Set laser power dial to 0%
  - Remove Material
  - Cleanup

# Tell Someone If...

- A familiar power setting isn't cutting the same.
- Multiple cutting paths are visible.
- Something doesn't work.
- You cut something you shouldn't have.