



Building a Sprocket and Two Other Projects

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Project #1 - The “easy project”



- From woodworking Joiner
- Part no longer available
- No access to machine

Sprocket Geometry

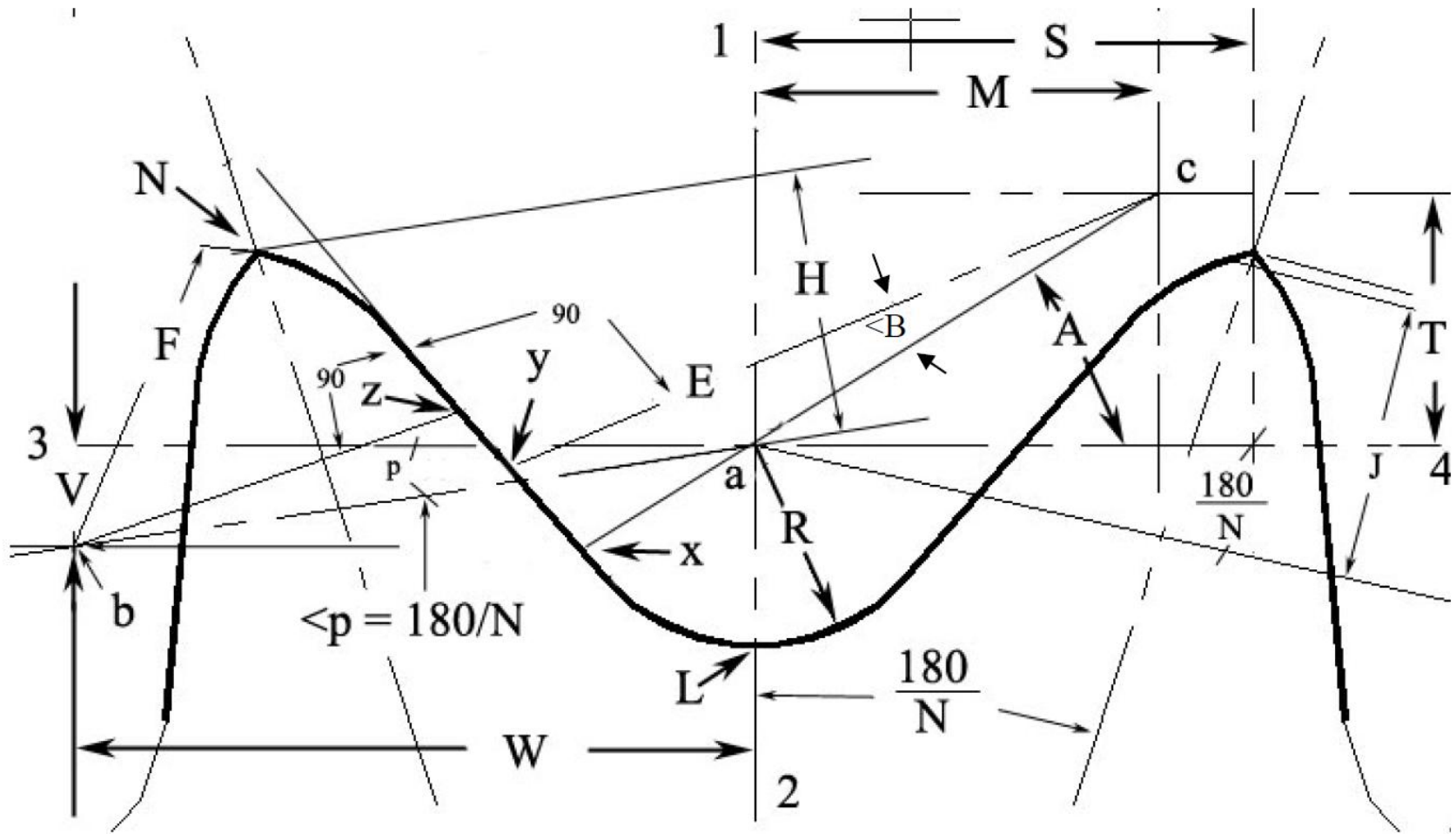


Fig. 1 Sprocket Tooth Geometry

(Adapted from the American Chain Association *Chains for Power Transmission and Material Handling* handbook.)

Parameter Calculation

P = Chain Pitch
N = Number of Teeth
Dr = Roller Diameter (See Table)

Ds = (Seating curve diameter) = $1.0005 \text{ Dr} + 0.003$

R = $Ds/2 = 0.5025 \text{ Dr} + 0.0015$

A = $35^\circ + \frac{60^\circ}{N}$

B = $18^\circ - \frac{56^\circ}{N}$

ac = $0.8 \times \text{Dr}$

M = $0.8 \times \text{Dr} \cos\left(35^\circ + \frac{60^\circ}{N}\right)$

T = $0.8 \times \text{Dr} \sin\left(35^\circ + \frac{60^\circ}{N}\right)$

E = $1.3025 \text{ Dr} + 0.0015$

Chordal Length of Arc xy = $(2.605 \text{ Dr} + 0.003)$

$\sin\left(9^\circ - \frac{28^\circ}{N}\right)$

$$yz = \text{Dr} \left[1.4 \sin\left(17^\circ - \frac{64^\circ}{N}\right) - 0.8 \sin\left(18^\circ - \frac{56^\circ}{N}\right) \right]$$

$$ab = 1.4 \text{ Dr}$$

$$W = 1.4 \text{ Dr} \cos \frac{180^\circ}{N}$$

$$V = 1.4 \text{ Dr} \sin \frac{180^\circ}{N}$$

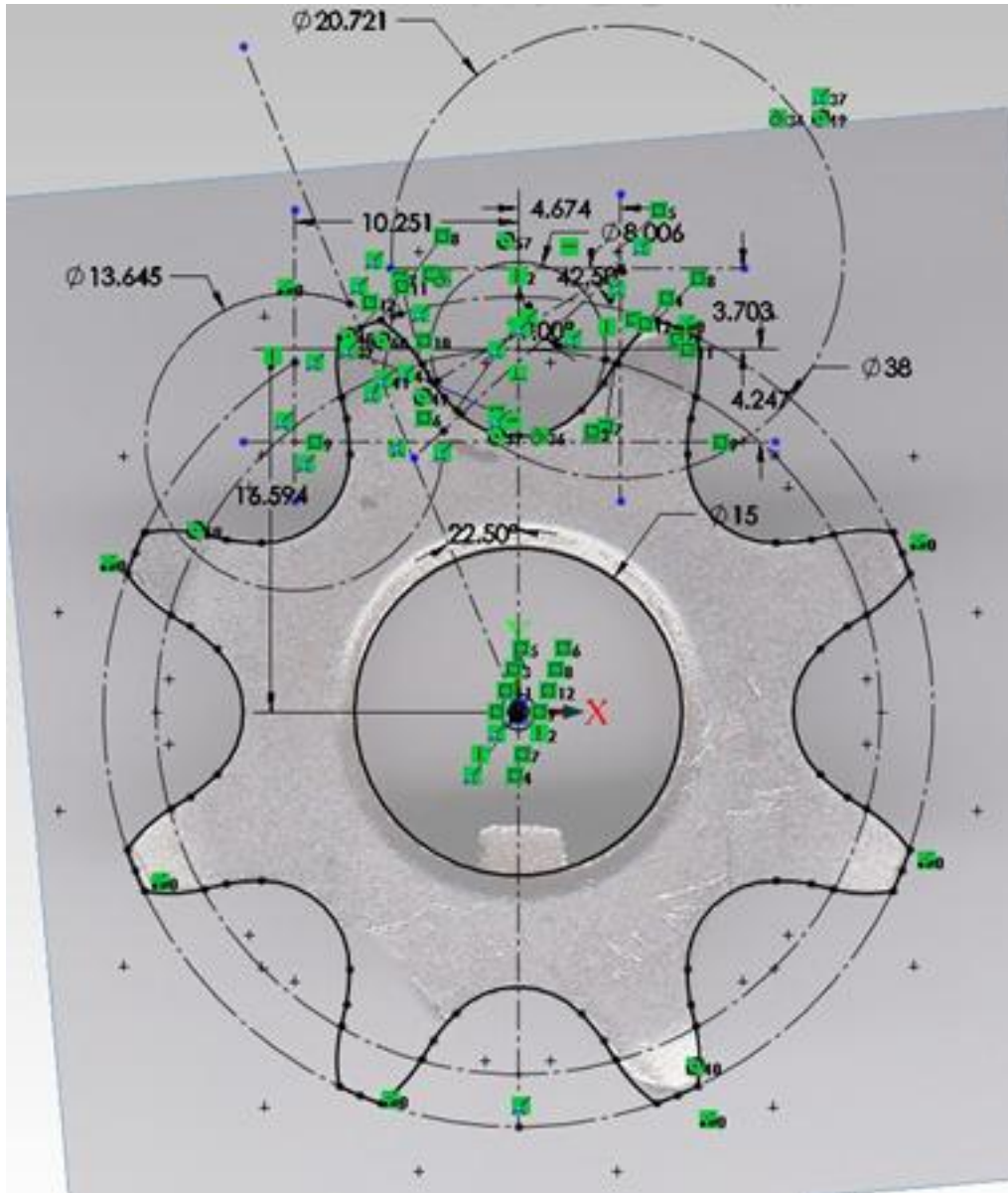
$$F = \text{Dr} \left[0.8 \cos\left(18^\circ - \frac{56^\circ}{N}\right) + 1.4 \cos\left(17^\circ - \frac{64^\circ}{N}\right) - 1.3025 \right] - .0015$$

$$H = \sqrt{F^2 - \left(1.4 \text{Dr} - \frac{P}{2}\right)^2}$$

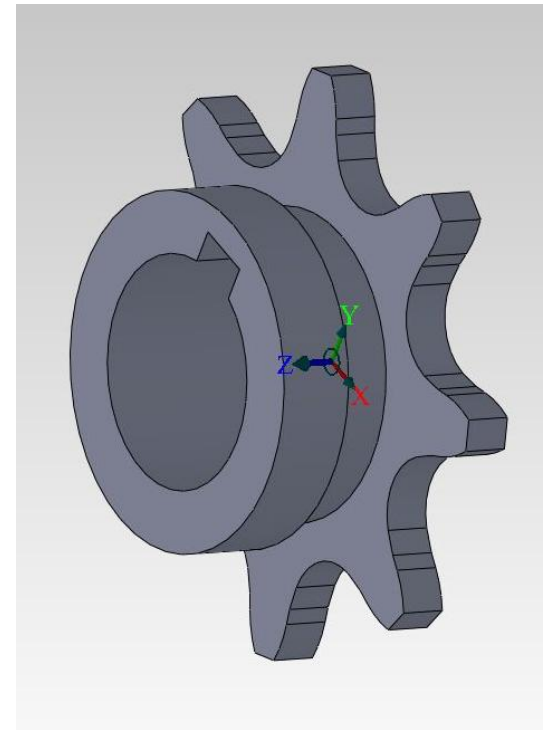
$$S = \frac{P}{2} \cos \frac{180^\circ}{N} + H \sin \frac{180^\circ}{N}$$

$$PD = \frac{P}{\sin \left[\frac{180^\circ}{N} \right]}$$

Building a CAD model



- Reverse engineering chain
- Redesign of keyway
- Material



Completed sprockets



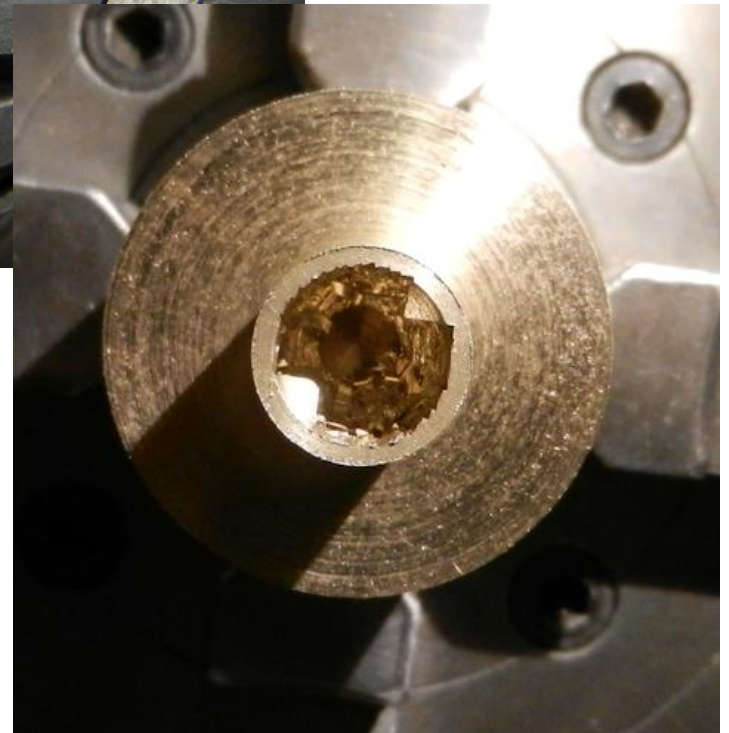
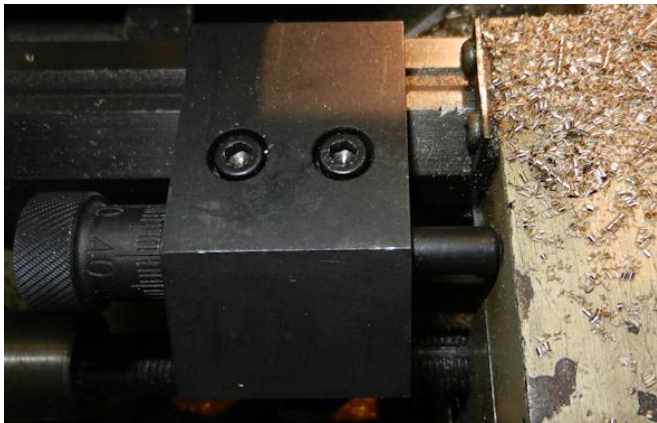
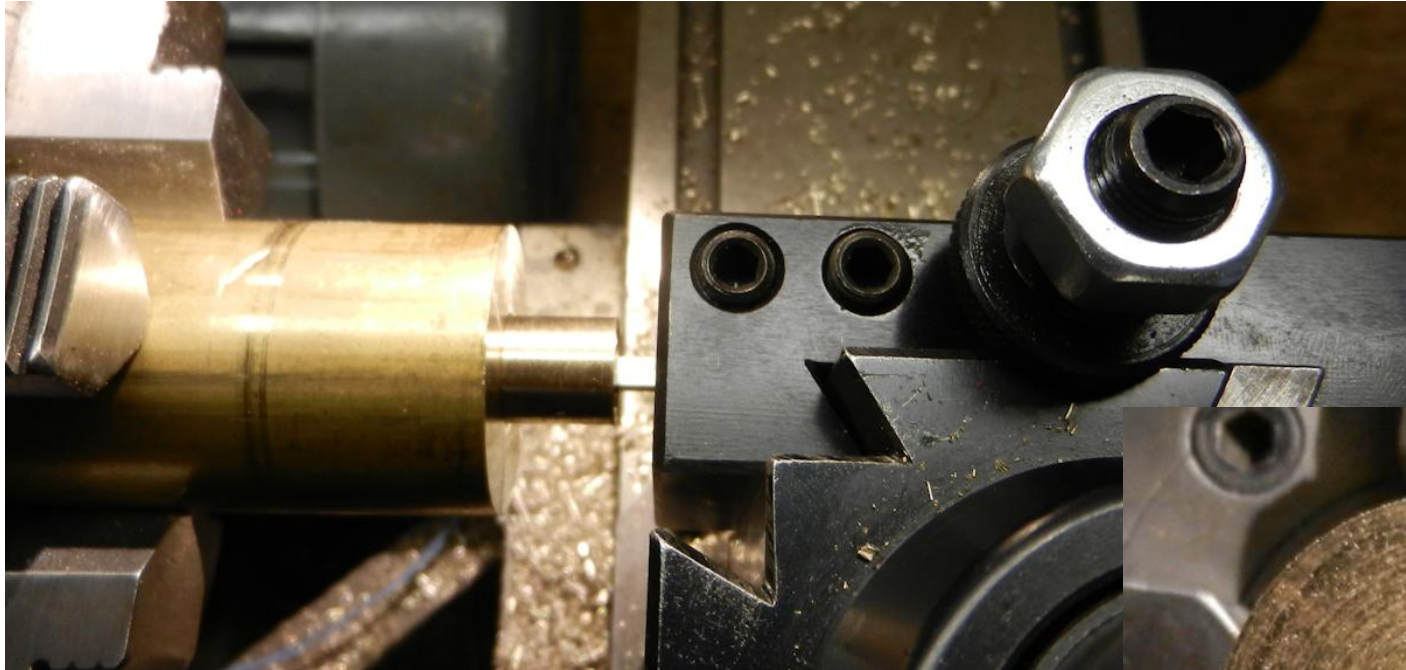
- Time to complete
 - Research & Design – 3 hours
 - Setup & Machining – 6 hours
 - Repair of broken probe – 8 hours

Project #2 - Building an impeller

- Plastic coolant flood pump impeller degraded
- Built new impeller out of brass
- Biggest challenge was broaching



Broaching on the lathe



Impeller CNC



Project #3 - Replacing car timing belt

- Timing belt is tensioned by eccentric water pump
- Manual calls for use of “special tool”
- Tool was special delivery and \$110
- Made from photo found on internet

Machining

- Scaled for CNC from picture
- Broaching square hole for 3/8" socket wrench



Questions?

