A steel Billet of diameter 5 in is reduced to 4.125" by cold work process.

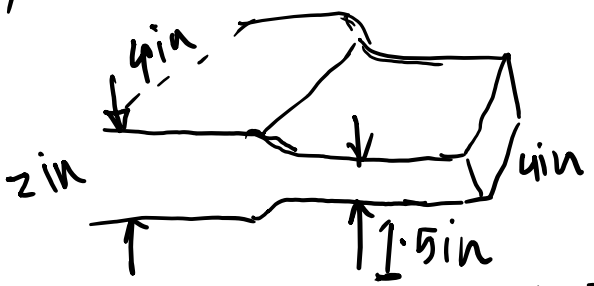
Determine %CW.

$\%CW = \frac{A_o - A_f}{A_o} \times 100\%$

$= \frac{\frac{\pi}{4}d_o^2 - \frac{\pi}{4}d_f^2}{\frac{\pi}{4}d_o^2} \times 100\%$

$= \frac{d_o^2 - d_f^2}{d_o^2} \times 100\% = \frac{5^2 - 4.125^2}{5^2} \times 100\%$

$= 31.94\%$



Assume Brass plate,

$\%CW = \frac{8-6}{8} = \frac{2}{8} \times 100\%$

$= 0.25 \times 100\%$

$= 25\%$

25% CW first, then H.W. at 600°F

First determine strength gain & Ductility loss

then determine strength loss & ductility gain in %

Find Final strength & ductility

At 25% CW → %EL = 18%

At 600F HW → %EL = 30%.

% Increase $= \frac{30-18}{18} \times 100\% = 66.7\%$ ↑

% strength increase/Decrease $= \frac{500-450}{450} = 11.1\%$ ↑

Another Problem:

A Brass Rod is done with 37% CW and subsequently Annealed at 1000 F.

1. Determine % change in Ductility after Hot work.
2. Determine % change in Strength after Hot work.
3. Determine final strength.
4. What is the microstructural configuration at the final stage?

Review Chapter 4 (Imperfections in Solids) to Chapter 7(Strengthening of Metals) for Test 2.

I will provide Brass and steel hot work microstructure chart.

Follow up with open lab lecture notes.