Solutions

2.1

- $N = 1000v/(\pi D) = 1000 \times 120/(\pi \times 80) = \mathbf{477}$ rpm.

2.2

- $\text{MRR} = vfd = 120\,000 \times 0.3 \times 3 = 108\,000$ mm^3/min $= \mathbf{1800}$ mm^3/s.
- $P = u \times \text{MRR} = 2.8 \times 1800 = \mathbf{5.04}$ kW.
- $t = L/(fN) = 300/(0.3 \times 477) = \mathbf{2.09}$ min.

2.3

- $R_a \approx f^2/(32r) = 0.3^2/(32 \times 0.8) = 0.00352$ mm $= \mathbf{3.52}$ µm.

3.1

- Taylor: $T = (C/v)^{1/n}$. At 120: $T = (400/120)^4 = \mathbf{123.5}$ min; at 180: $T = (400/180)^4 = \mathbf{24.4}$ min.
- At 180 m/min $N = 716$ rpm and a pass takes $300/(0.3 \times 716) = 1.40$ min. Passes per edge: $123.5/2.09 = \mathbf{59}$ at 120; $24.4/1.40 = \mathbf{17}$ at 180.
- The faster speed saves a third of the machine time but changes edges three times as often: it wins only when machine time costs more than edges and tool changes.

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