Aufgabe 4:

Schruppen	Schlichten
$d_R = 150\,mm$; $d_z = 140{,}6\,mm$	$d_f = 140\,mm$; $v_c = 400\,\frac{m}{min}$
$v_c = 250\,\frac{m}{min}$; $f = 0{,}4\,mm$	$R_{t\,max} = 0{,}8\,\mu m$

geg.: C45

Hartmetall P10; $\alpha = 5°$; $\gamma = 6°$; $\kappa = 70°$; $\kappa_\varepsilon = 90°$; $\lambda = 0°$; $\varepsilon = 0{,}8\,mm$

a) ges.: n, a_p, F_c; F_f, F_p

Rechnung: $n = \frac{v_c}{\pi \cdot d} = \frac{250\,\frac{m}{min}}{\pi \cdot 0{,}15\,mm} = 531\,\frac{1}{min}$

$a_p = \frac{(d_R - d_f)}{2} = \frac{(150\,mm - 140{,}6\,mm)}{2} = 4{,}7\,mm$

$F_c = k_{c1.1} \cdot b \cdot h^{1-m_c} = k_{c1.1} \cdot \left(\frac{a_p}{\sin(\kappa)}\right) \cdot (f \cdot \sin(\kappa))^{1-m_c}$

$= 2220 \cdot \left(\frac{4{,}7\,mm}{\sin(70°)}\right) \cdot (0{,}4 \cdot \sin(70°))^{1-0{,}14} = 4721{,}82\,[N]$

$F_f = k_{f1.1} \cdot b \cdot h^{1-m_c} = k_{f1.1} \cdot \left(\frac{a_p}{\sin(\kappa)}\right) \cdot (f \cdot \sin(\kappa))^{1-m_f}$

$343 \cdot \left(\frac{4{,}7\,mm}{\sin(70°)}\right) \cdot (0{,}4 \cdot \sin(70°))^{1-0{,}14} = 1247{,}64\,[N]$

$F_p = k_{p1.1} \cdot b \cdot h^{1-m_p} = k_{p1.1} \cdot \left(\frac{a_p}{\sin(\kappa)}\right) \cdot (f \cdot \sin(\kappa))^{1-m_p}$

$263 \cdot \left(\frac{4{,}7\,mm}{\sin(70°)}\right) \cdot (0{,}4 \cdot \sin(70°))^{1-0{,}14} = 784{,}13\,[N]$

b) geg.: $K_{Ver} = 1{,}3$; $P = 28\,kW$; $\eta = 0{,}8$ ges.: $F_{c\,Verschleiß}$; P

$F_{c\,Verschleiß} = k_{c1.1} \cdot b \cdot h^{1-m_c} \cdot K_{Ver} = 2220 \cdot \left(\frac{4{,}7\,mm}{\sin(70°)}\right) \cdot (0{,}4 \cdot \sin(70°))^{1-0{,}14} \cdot 1{,}3 = 6138{,}5\,[N]$

$P = F_c \cdot v_c = 6138{,}5\,N \cdot 250\,\frac{m}{min} = 25{,}58\,kW$

$P_{erf} = \frac{P}{\eta} = \frac{25{,}58\,kW}{0{,}8} = 31{,}97 > P$

c) $R_t = \frac{f^2}{8 \cdot r_\varepsilon} \Rightarrow f = \sqrt{R_t \cdot 8 r_\varepsilon}$

$f = \sqrt{0{,}0008\,mm \cdot 8 \cdot 0{,}8\,mm}$

$f = 0{,}07\,mm$