

```
clear
% U2-20
% A-etan, B-metan, C-O2, D-N2, E-voda, G-CO2
```

```
% proudy 3-vystup voda a 4-vystup suche spaliny
```

```
% 7.35 kg vody za 60+12 minut
n3 = (7.35/18e-3)/((60+12)/60) % mol/h
```

```
n3 = 340.2778
```

```
% 15.5 dm3/s suchych spalin
n4 = 98e3/(8.314*333.15)*15.5e-3*3600 % mol/h
```

```
n4 = 1.9743e+03
```

```
% proud 2 je vlhky vzduch-vstup
syms wC2 real % obsah O2 ve vlhkem vzduchu
assumeAlso(wC2>0)
assumeAlso(wC2<21/100) % obsah O2 muze byt mezi 0 a 21%

wD2 = 79/21*wC2 % obsah N2 ve vlhkem vzduchu
```

```
wD2 =

$$\frac{79 wC_2}{21}$$

```

```
wE2 = 1-wC2-wD2 % obsah H2O ve vlhkem vzduchu
```

```
wE2 =

$$1 - \frac{100 wC_2}{21}$$

```

```
syms n1 n2 xi1 xi2 real
assume(n1>0)
assume(n2>0)
assume(xi1>0)
assume(xi2>0)

% nezname slozeni suchych spalin (proud 4)
syms wC4 wD4 wG4 real

% balance vseh slozek a celkova balance
eqA = 0.852*n1-xi1==0
```

```
eqA =
```

$$\frac{213 n_1}{250} - \xi_1 = 0$$

$$\text{eqB} = 0.113 \cdot n_1 - \xi_2 = 0$$

$$\text{eqB} =$$

$$\frac{113 n_1}{1000} - \xi_2 = 0$$

$$\text{eqC} = wC_2 \cdot n_2 - 7/2 \cdot \xi_1 - 2 \cdot \xi_2 = wC_4 \cdot n_4$$

$$\text{eqC} =$$

$$n_2 wC_2 - 2 \xi_2 - \frac{7 \xi_1}{2} = \frac{4341504535695459 wC_4}{2199023255552}$$

$$\text{eqD} = 0.035 \cdot n_1 + wD_2 \cdot n_2 = wD_4 \cdot n_4$$

$$\text{eqD} =$$

$$\frac{7 n_1}{200} + \frac{79 n_2 wC_2}{21} = \frac{4341504535695459 wD_4}{2199023255552}$$

$$\text{eqE} = wE_2 \cdot n_2 + 3 \cdot \xi_1 + 2 \cdot \xi_2 = n_3$$

$$\text{eqE} =$$

$$3 \xi_1 + 2 \xi_2 - n_2 \left(\frac{100 wC_2}{21} - 1 \right) = \frac{6125}{18}$$

$$\text{eqG} = 2 \cdot \xi_1 + \xi_2 = wG_4 \cdot n_4$$

$$\text{eqG} =$$

$$2 \xi_1 + \xi_2 = \frac{4341504535695459 wG_4}{2199023255552}$$

$$\text{eqtot} = n_1 + n_2 + 0.5 \cdot \xi_1 = n_3 + n_4$$

$$\text{eqtot} =$$

$$n_1 + n_2 + \frac{\xi_1}{2} = \frac{1272445820594087}{549755813888}$$

% prebytek vzduchu

P = 0.3;

n2teor = 1/wC2*(7/2*xi1+2*xi2); % aby nezbyl O2 na vystupu

eqP = n2==(1+P)*n2teor

$$\text{eqP} =$$

$$n_2 = \frac{13 \left(\frac{7 \xi_1}{2} + 2 \xi_2 \right)}{10 wC_2}$$

```
sol=solve([eqA,eqB,eqC,eqD,eqE,eqG,eqtot,eqP],[n1,n2,xi1,xi2,wC2,wC4,wD4,wG4]);  
n1sol = eval(sol.n1) % mol/h plyn
```

```
n1sol = 106.7007
```

```
n2sol = eval(sol.n2) % mol/h vlhky vzduch
```

```
n2sol = 2.1624e+03
```

```
wC2sol = eval(sol.wC2) % O2 ve vzduchu
```

```
wC2sol = 0.2058
```

```
wE2sol = eval(subs(wE2,wC2,wC2sol)) % H2O ve vzduchu
```

```
wE2sol = 0.0201
```

```
wD2sol = eval(subs(wD2,wC2,wC2sol)) % N2 ve vzduchu
```

```
wD2sol = 0.7741
```

```
wC4sol = eval(sol.wC4) % O2 ve spalinach
```

```
wC4sol = 0.0520
```

```
wD4sol = eval(sol.wD4) % N2 ve spalinach
```

```
wD4sol = 0.8498
```

```
wG4sol = eval(sol.wG4) % CO2 ve spalinach
```

```
wG4sol = 0.0982
```

```
xi1sol = eval(sol.xi1) % mol/h rozsah R1
```

```
xi1sol = 90.9090
```

```
xi2sol = eval(sol.xi2) % mol/h rozsah R2
```

```
xi2sol = 12.0572
```

```
% spotreba vlhkeho vzduchu v m3/h  
V2 = n2sol*8.314*298.15/98e3 % m3/h
```

```
V2 = 54.6962
```

```
% kontrola slozeni proud 4  
kontrola = wC4sol+wD4sol+wG4sol
```

```
kontrola = 1
```