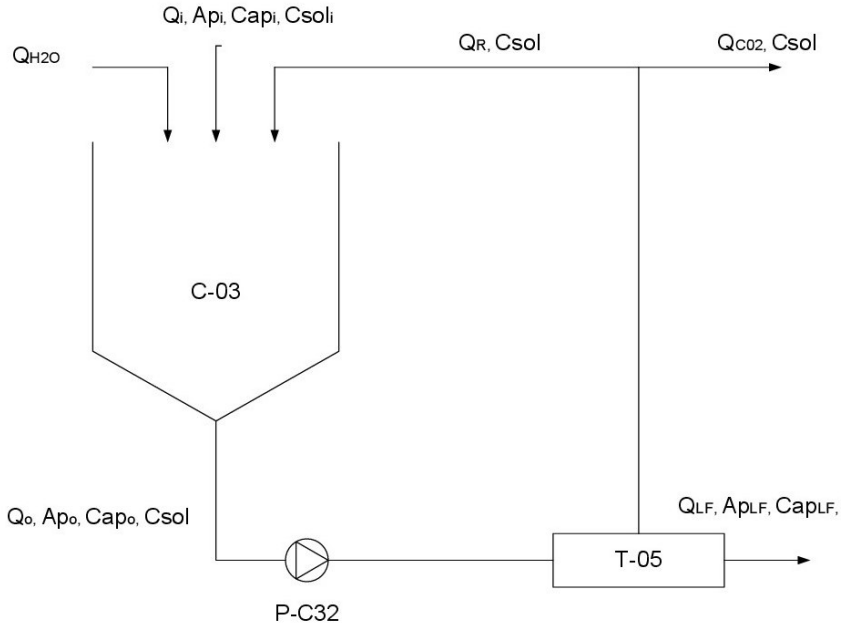
```
(*Versió final,
en estat estacionari*)
(* Q: Cabals màssics, Ap:
 % en pes d'apatita en un corrent,
CAp: % de col.làgen atrapat a
 la massa d'aptita respecte
 al pes total del sòlid,
Csol: % de col·làgen en pes en fase
 aquosa, VR: volum del reactor *)
```



*In[1]:=*

```
(*Nota: en Realitat Dens=
 inversa densitat*)

Clear[VR, QH2O, Qi, Qo, QR, Krec, K1, Qc2, Qlf, Qmin,
 Qmax, Vmin, Vmax, Api, Apo, Aplf, CApi, CApo, CAplf, Csol,
 Csoli, v, vv, v1, vv1, v2, vv2, v3, vv3, v4, vv4, Dens, Pes]
(*VR=2500;*)
(*QH2O=2500;Qi=1500;Krec=0.1; Qo=(Qi+QH2O)/(1-Krec);QR=Krec*Qo*)

Dens = 0.785714285

Api = 0.5; K1 = 0.5165048543689322; Qi = 1500;
Csoli = 0.09; CApi = 0.128; (*Qo=QH2O+Qi*); Qo = 4150

Krec == QR / Qo; QR = Qo - Qi - QH2O;
Apo = Qi Api / (Qi + QH2O + QR)
CApo = ((Qi Api CApi + Qi/(Qi+QH2O) K1 VR/Dens (Api CApi + Csoli)))/((Qo Apo + (Qo Apo/(Qo-QR) + 1) K1 VR/Dens))
Csol = (Qi (Api CApi + (1 - Api) Csoli) - Qo Apo CApo)/(Qi + QH2O)

Qmin = 1000; Qmax = Qo - Qi; Vmin = 1600; Vmax = 2000;

Plot3D[Apo, {QH2O, Qmin, Qmax}, {VR, Vmin, Vmax}, PlotPoints → 40,
  BoxRatios → {4, 4, 1.6}, FaceGrids → All, AxesLabel → {"
Q_H2o", "V_R", "%Apatita"}];
Plot3D[CApo, {QH2O, Qmin, Qmax}, {VR, Vmin, Vmax}, PlotPoints → 40,
  BoxRatios → {4, 4, 1.6}, FaceGrids → All, AxesLabel → {"
Q_H2o", "V_R", "%Col en apatita"}];
Plot3D[Csol, {QH2O, Qmin, Qmax}, {VR, Vmin, Vmax}, PlotPoints → 40,
  BoxRatios → {4, 4, 1.6}, FaceGrids → All, AxesLabel → {"
Q_H2o", "V_R", "%Col en solució"}];
Plot3D[((Qo * Csol) - (QR * Csol) - (Qi * (1 - Api) * Csoli)),
  {QH2O, Qmin, Qmax}, {VR, Vmin, Vmax}, PlotPoints → 40,
  BoxRatios → {4, 4, 1.6}, FaceGrids → All, AxesLabel → {"
Q_H2o", "V_R", "Kg/h colàgen extrets"}];

Null
```

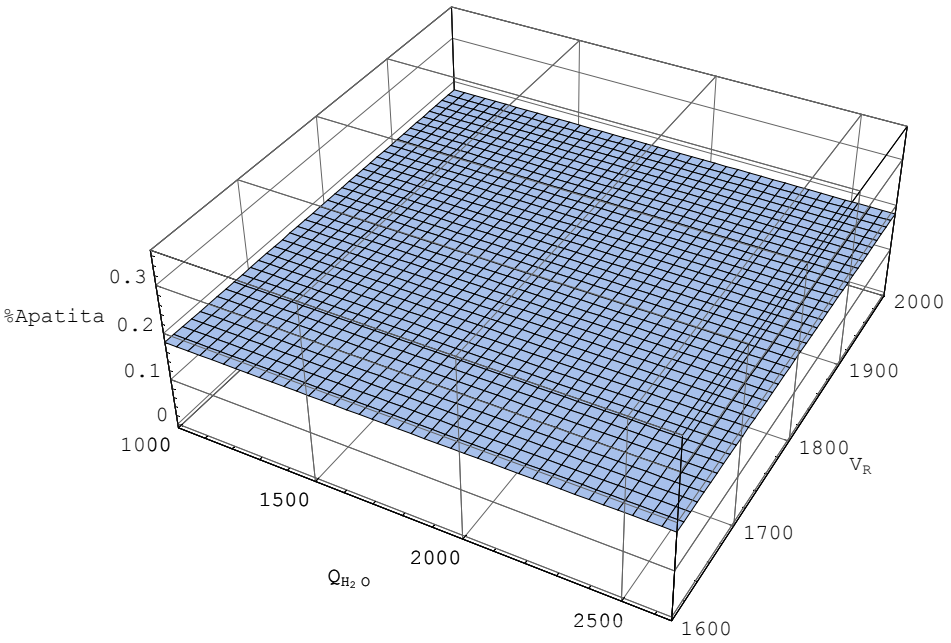
*Out[2]=* 0.785714

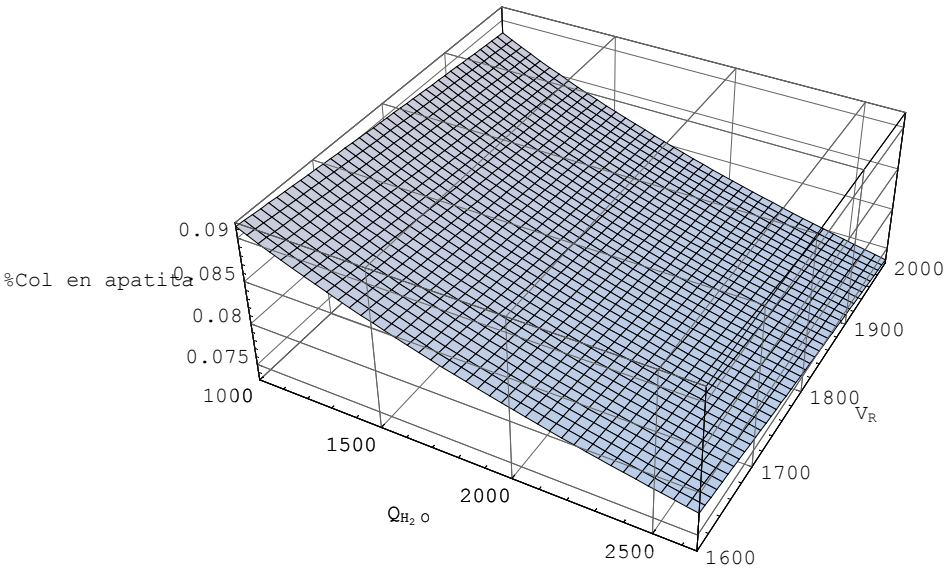
*Out[3]=* 4150

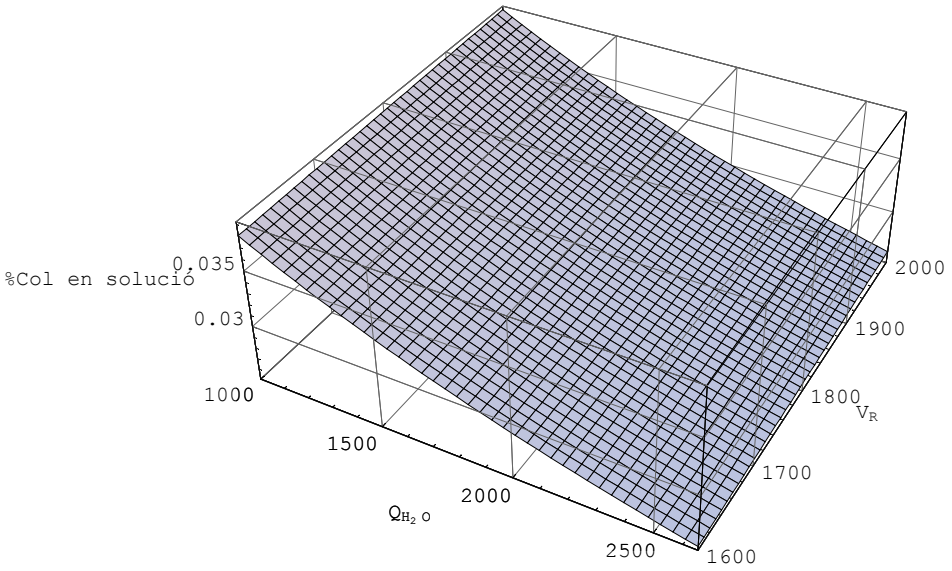
*Out[5]=* 0.180723

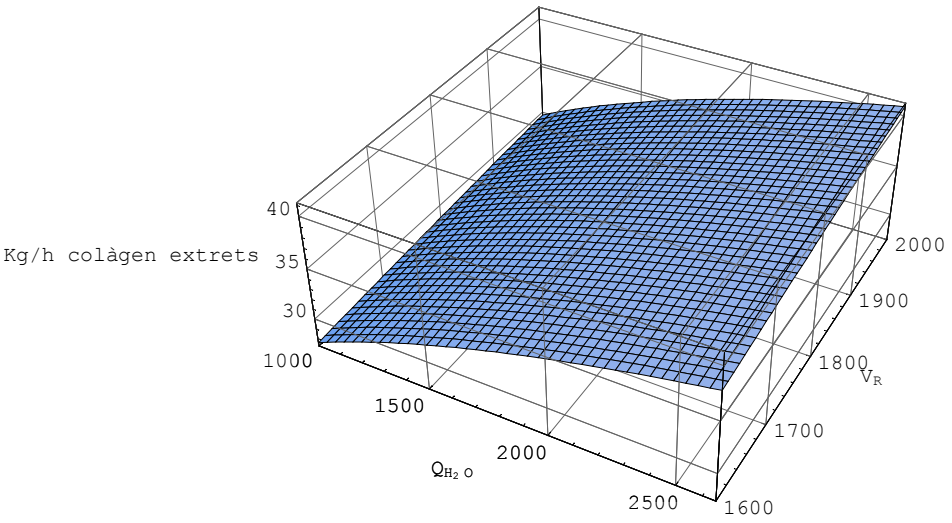
*Out[6]=*
$$\frac{96. + \frac{151.852\,VR}{1500+QH2O}}{750. + 0.65737\left(1 + \frac{750.}{1500+QH2O}\right) VR}$$

*Out[7]=*
$$\frac{163.5 - \frac{750.\left(96. + \frac{151.852\,VR}{1500+QH2O}\right)}{750. + 0.65737\left(1 + \frac{750.}{1500+QH2O}\right) VR}}{1500 + QH2O}$$


%Apatita
0.3
0.2
0.1
0
1000
1500
2000
2500
$Q_{H_2O}$
1600
1700
1800
1900
2000
$V_R$


%Col en apatita
0.09
0.085
0.08
0.075
1000
1500
2000
2500
$Q_{H_2O}$
1600
1700
1800
1900
2000
$V_R$


%Col en solució
0.035
0.03
1000
1500
2000
2500
$Q_{H_2O}$
1600
1700
1800
1900
2000
$V_R$


Kg/h colàgen extrets
40
35
30
1000
1500
2000
2500
$Q_{H_2O}$
1600
1700
1800
1900
2000
$V_R$

```
Clear[VR, QH2O, Qi, Qo, Krec, K1, Qc2, Qlf, Qmin,
 Qmax, Vmin, Vmax, Api, Apo, Aplf, CApi, CApo, CAplf, Csol,
 Csoli, v, vv, v1, vv1, v2, vv2, v3, vv3, v4, vv4, Dens, Pes]
(*VR=2500;*)
(*QH2O=2500;Qi=1500;Krec=0.1; Qo=(Qi+QH2O)/(1-Krec);QR=Krec*Qo*)

(*Api=0.55; K1=.2;Csoli=0.04;CApi=0.12;*)
Qi = 1500; Qo = 4150; CApo = 0.09; Api = 0.5;
Csoli = 0.088; VR = 1250; Csol = 0.0270; QH2O = 2000;

Krec == QR / Qo; QR = Qo - Qi - QH2O
v1 = Apo == Qi Api / (Qi + QH2O + QR)
v2 = CApo == ((Qi Api CApi + Qi/(Qi+QH2O) K1 VR (Api CApi + Csoli)))/((Qo Apo + ((Qo Apo)/(Qo-QR) + 1) K1 VR))
v3 = Csol == (Qi (Api CApi + (1 - Api) Csoli) - Qo Apo CApo)/(Qi + QH2O)


Solve[{v1, v2, v3}, { Apo, CApi, K1}]

Null

650

Apo == 0.180723

0.09 == (750. CApi + 3750/7 (0.088 + 0.5 CApi) K1)/(4150 Apo + 1250 (1 + (83 Apo)/70) K1)

0.027 == (-373.5 Apo + 1500 (0.044 + 0.5 CApi))/3500

{{CApi → 0.128, Apo → 0.180723, K1 → 0.516505}}
```