4. VAJA: SIMULACIJA KONTINUIRNEGA BIOPROCESA

Datum: 1.12.2006

1. OSNOVE

Imamo bioreaktor, kjer je $F_v=F_{iz}$, zato je $\frac{dV}{dt}=0$. Zaradi poenostavitve predpostavimo idealno pomešanje c(v reaktorju)=c_{iz}.

$\frac{d(cV)}{dt}=F_V c_V - F_{iz} c_{iz} \pm rV$ ($\pm$ zaradi tega, ker je odvisno ali pišemo bilanco za S ali P)

Glede na to, da je v stacionarnem stanju $\frac{d(cV)}{dt}=c\frac{dV}{dt}+V\frac{dc}{dt}=0$ (dV=0, dc=0), velja

$F_V c_V = F_{iz} c_{iz} \pm rV$

{Example BIOREACT}

{Fermentation in a bioreactor either batch, fedbatch or continuous.}
{The flow rates F0 and F1 need to be set correctly for each reactor type.}

{Flow rates are initially set to zero. They can be switched on by
changing their values. A chemostat would have F0=F1, a batch reactor F0=F1=0 and a fedbatch F1=0}

{A steady state X-D curve for a chemostat can be made using the Parametric Run feature, but the statement F1=F0 needs to be activated in the program by removing the brackets. Make sure the steady state is actually reached.}

{Biokinetic parameters}
UM=0.3 {Specific growth rate, 1/h}
KS=0.1 {Monod saturation constant, kg/m3}
K1=0.003 {Non-growth associated product constant, 1/h}
K2=0.008 {Growth associated product constant, kg product/kg biomass}
Y=0.8 {Yield constant, kg biomass/kg substrate}

{Feed and flow conditions}
SF=10 {Substrate conc. in feed, kg/m3}
F0=0.1 {Feed flow rate, m3/h}
F1=0 {Outlet flow rate, m3/h}

METHOD Auto
STARTTIME=0
STOPTIME=50

2. NALOGA

S pomočjo računalniške simulacija kontinuirnega procesa s spreminjanjem D poiskati vrednost, pri kateri izpiramo biomaso, določiti stacionarne vrednosti X in S, ter čas, potreben za vzpostavitev stacionarnega stanja.

3. APARATURA

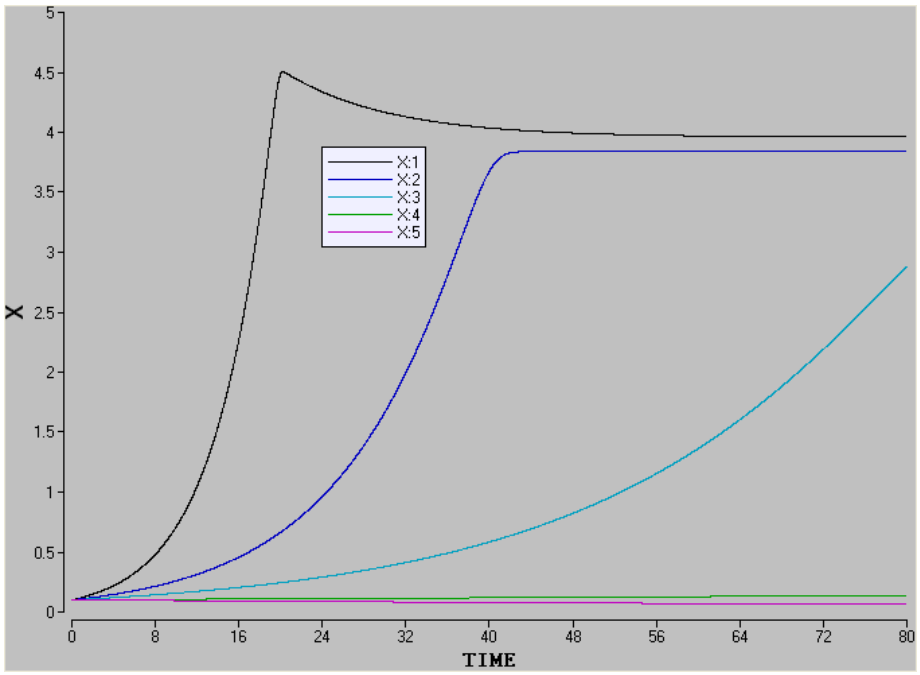
Računalnik in program Berkeley Madonna.

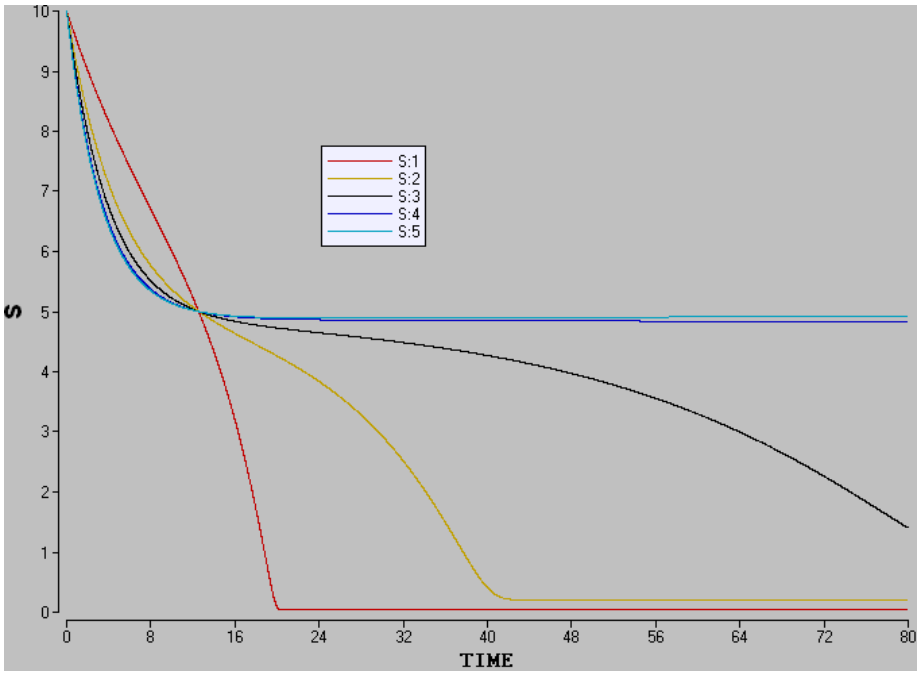
4. MERITVE IN IZRAČUNI

$F_0=F_1$
spreminjali smo F_0:

krivulja	**1**	**2**	**3**	**4**	**5**
$F_0=F_1$=	**0,1**	**0,2**	**0,25**	**0,29**	**0,30**

Ker je D=F/V, smo z večanjem F (pri konstantnem V) torej večali tudi D





Vidimo, da se z večanjem F_0 začne izpiranje biomase (X), najhitreje je to pri F_0=0.3. (natančno 0,29698599)
Ko pride do izpiranja biomase, pride tudi do izpiranja substrata.