

BPL_TEST2_Fedbatch - demo

This notebook just produce the Figure 2 in the paper "Design ideas behind Bioprocess Library for Modelica", by J P Axelsson, presented in the 15th International Modelica Conference in Aachen, Germany, October 9-11, 2023.

Unfortunately the Linux FMU from OpenModelica does not work and therefore Windows FMU from JModelica is used. Thus Google Colab cannot run the example.

In [1]: `run -i BPL_TEST2_Fedbatch_explore.py`

Windows - run FMU pre-compiled JModelica 2.14

Model for the process has been setup. Key commands:

- `par()` - change of parameters and initial values
- `init()` - change initial values only
- `simu()` - simulate and plot
- `newplot()` - make a new plot
- `show()` - show plot from previous simulation
- `disp()` - display parameters and initial values from the last simulation
- `describe()` - describe culture, broth, parameters, variables with values/units

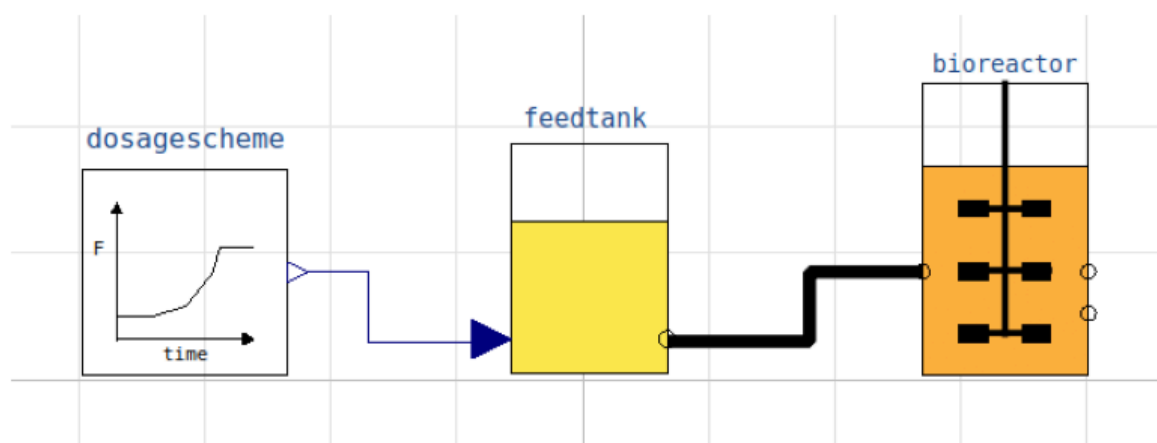
Note that both `disp()` and `describe()` takes values from the last simulation and the command `process_diagram()` brings up the main configuration

Brief information about a command by `help()`, eg `help(simu)`

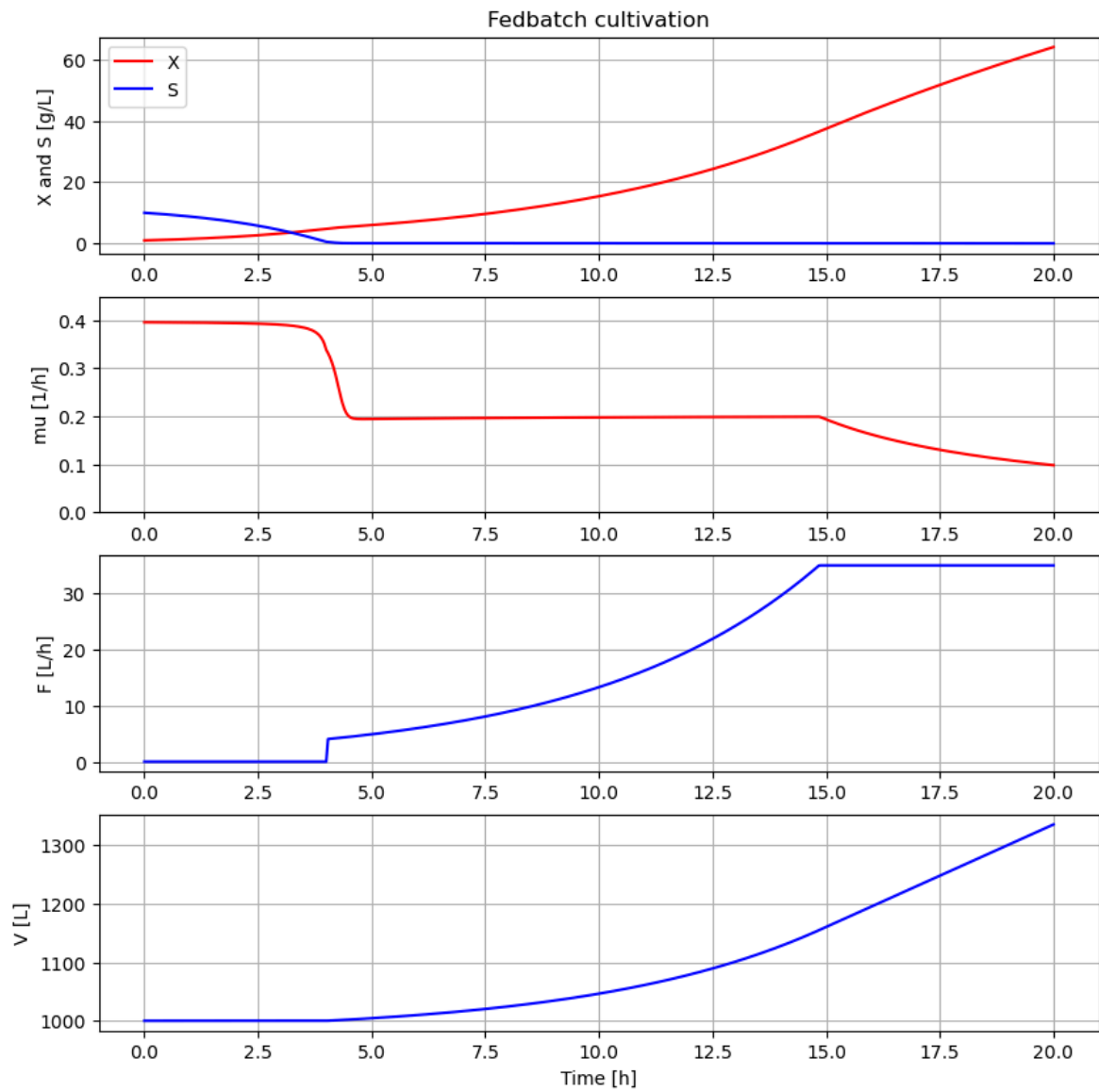
Key system information is listed with the command `system_info()`

In [2]: `%matplotlib inline`
`plt.rcParams['figure.figsize'] = [25/2.54, 25/2.54]`

In [3]: `process_diagram()`



In [4]: `# Simulation with default values of the process`
`newplot(plotType='TimeSeries')`
`ax2.set_ylim([0, 0.45])`
`init(V_0=1000, VX_0=1*1e3, VS_0=10*1e3)`
`par(feedtank_S_in=600, Ks=0.1, Y=0.40)`
`par(t_start=4, F_start=4.0, mu_feed=0.2, F_max=35)`
`simu(20)`



In [5]: `describe('mu')`

Cell specific growth rate variable : 0.098 [1/h]

In [6]: `describe('parts')`

['bioreactor', 'bioreactor.culture', 'dosagescheme', 'feedtank', 'liquidphase', 'MSL']

In [7]: `describe('MSL')`

MSL: RealInput, RealOutput

In [8]: `system_info()`

System information

- OS: Windows
- Python: 3.12.9
- Scipy: not installed in the notebook
- PyFMI: 2.16.3
- FMU by: JModelica.org
- FMI: 2.0
- Type: FMUModelCS2
- Name: BPL_TEST2.Fedbatch
- Generated: 2023-03-30T09:13:00
- MSL: 3.2.2 build 3
- Description: Bioprocess Library version 2.1.1
- Interaction: FMU-explore version 0.9.8

In []: