

## ▼ BPL\_TEST2\_Chemostat script with FMPy ver 0.3.15

The key library FMPy v0.3.15 is installed.

After the installation a small application BPL\_TEST2\_Chemostat is loaded and run. You can continue with this example if you like.

```
lslsb_release -a # Actual VM Ubuntu version used by Google

No LSB modules are available.
Distributor ID: Ubuntu
Description:   Ubuntu 20.04.5 LTS
Release:       20.04
Codename:      focal

%env PYTHONPATH=

env: PYTHONPATH=

!wget https://repo.anaconda.com/miniconda/Miniconda3-py38_22.11.1-1-Linux-x86_64.sh
!chmod +x Miniconda3-py38_22.11.1-1-Linux-x86_64.sh
!bash ./Miniconda3-py38_22.11.1-1-Linux-x86_64.sh -b -f -p /usr/local
import sys
sys.path.append('/usr/local/lib/python3.8/site-packages/')

--2023-03-21 14:32:58--  https://repo.anaconda.com/miniconda/Miniconda3-py38_22.11.1-1-Linux-x86_64.sh
Resolving repo.anaconda.com (repo.anaconda.com)... 104.16.131.3, 104.16.130.3, 2606:4700::6810:8303, ...
Connecting to repo.anaconda.com (repo.anaconda.com)|104.16.131.3|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 64630241 (62M) [application/x-sh]
Saving to: 'Miniconda3-py38_22.11.1-1-Linux-x86_64.sh'

Miniconda3-py38_22. 100%[=====] 61.64M  105MB/s   in 0.6s

2023-03-21 14:32:59 (105 MB/s) - 'Miniconda3-py38_22.11.1-1-Linux-x86_64.sh' saved [64630241/64630241]

PREFIX=/usr/local
Unpacking payload ...

Installing base environment...

Downloading and Extracting Packages

Downloading and Extracting Packages

Preparing transaction: done
Executing transaction: done
installation finished.

!conda update -n base -c defaults conda --yes
```

```
Preparing transaction: done  
Verifying transaction: done  
Executing transaction: done
```

```
!conda --version  
!python --version
```

```
conda 23.1.0  
Python 3.8.15
```

```
!conda install -c conda-forge fmpy --yes # Install the key package
```

```
Preparing transaction: done
Verifying transaction: done
Executing transaction: done
```

## ▼ Now specific installation run a simulation and notebook for that

Start with connecting to Github. Then upload the two files:

- FMU - BPL\_TEST2\_Chemostat\_linux\_om\_me.fmu
- Setup-file - BPL\_TEST2\_Chemostat\_fmпы\_explore.py

```
%%bash
git clone https://github.com/janpeter19/BPL_TEST2_Chemostat

Cloning into 'BPL_TEST2_Chemostat'...

%cd BPL_TEST2_Chemostat

/content/BPL_TEST2_Chemostat
```

## ▼ BPL\_TEST2\_Chemostat - demo

```
run -i BPL_TEST2_Chemostat_fmпы_explore.py

Linux - run FMU pre-compiled OpenModelica 1.21.0

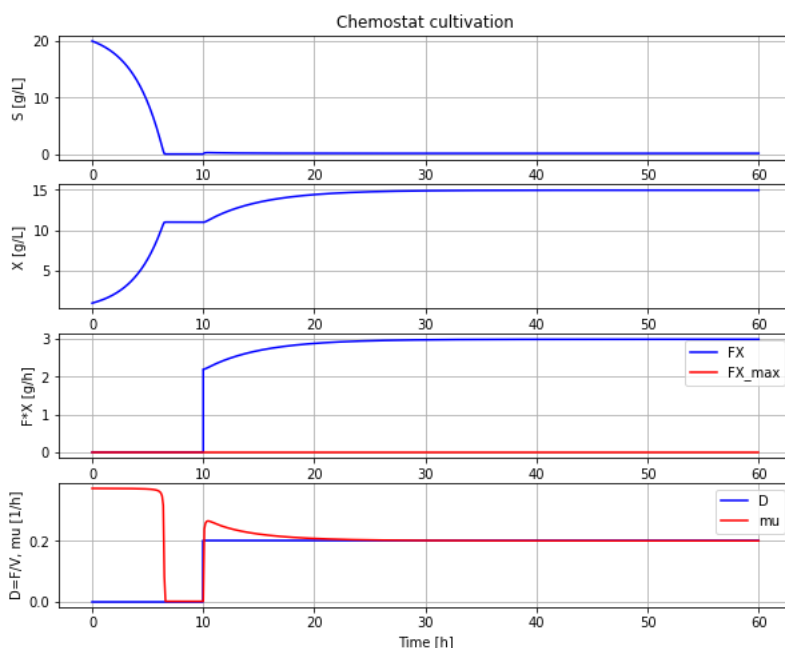
Model for bioreactor has been setup. Key commands:
- par()      - change of parameters and initial values
- init()     - change initial values only
- simu()     - simulate and plot
- newplot()  - make a new plot
- show()     - show plot from previous simulation
- disp()     - display parameters and initial 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

Brief information about a command by help(), eg help(simu)
Key system information is listed with the command system_info()
```

```
%matplotlib inline
plt.rcParams['figure.figsize'] = [25/2.54, 20/2.54]
```

```
newplot()
par(Y=0.50, qSmax=0.75, Ks=0.1)      # Culture parameters
init(V_0=1.0, VX_0=1.0, VS_0=20)    # Bioreactor startup
par(S_in=30, t0=0, F0=0, t1=10, F1=0.2) # Substrate feeding
simu(60)
```



```
describe('parts')
```

```
['bioreactor', 'bioreactor.culture', 'D', 'dosagescheme', 'feedtank', 'harvesttank']
```

[+ Code](#)[+ Text](#)

```
describe('MSL')
```

```
MSL: 3.2.3 - used components: RealInput, RealOutput, CombiTimeTable, Types
```

```
system_info()
```

```
System information
```

```
-OS: Linux
```

```
-Python: 3.9.16
```

```
-Scipy: not installed in the notebook
```

```
-FMPy: 0.3.15
```

```
-FMU by: OpenModelica Compiler OpenModelica 1.21.0-dev-185-g9d983b8
```

```
-FMI: 2.0
```

```
-Type: ME
```

```
-Name: BPL_TEST2.Chemostat
```

```
-Generated: 2023-02-13T10:27:14Z
```

```
-MSL: 3.2.3
```

```
-Description: Bioprocess Library version 2.1.1-beta
```

```
-Interaction: FMU-explore for FMPy version 0.9.7b
```

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✓ 0s completed at 15:37

