EXPECTATION: 1 month + 10 days : 17th NOV

SIMULATOR FOR LAB EXPERIMENT USING DYMOLA AND MATLAB

Previous Info / Ideation:

- $F_{C,i} = F_{C,o}$
- $F_{H,i} = F_{H,o}$
- Unsteady/Steady State Temp Profile
- $V_C C_p \rho \frac{dT_{C,O}}{dt} = F_{C,i} C_p \rho (T_{C,i} - T_{C,o}) - UA(\frac{\Delta T_i - \Delta T_o}{ln(\frac{\Delta T_i}{\Delta T_o})})$
- $V_h C_p \rho \frac{dT_{h,O}}{dt} = F_{h,i} C_p \rho (T_{h,i} - T_{h,o}) - UA(\frac{\Delta T_i - \Delta T_o}{ln(\frac{\Delta T_i}{\Delta T_o})})$
- Dymola has Real-Time Synchronizer: Creates a binary file which can be linked to MATLAB using OPC Server
- Insert measurements USING GUI, link it with Dymola model
- Example: PULP MILL SIMULATOR
- Use of Laplace Transform

TO BUILD:

- INPUT USING MATLAB AND OUTPUT USING OPC Dymola SIMULATION

REFERENCES:

- Multi-Domain Vehicle Dynamics Simulation in Dymola
- https://www.researchgate.net/publication/267584633_Application_of_Systems_xModeling_and_Simulation_in_the_Discrete_Ratio_Automatic_Transmission_Calibration_Process_for_an_Automobile/figures?lo=1
- (PDF) Dynamic Simulation of a 1MWe CSP Tower Plant with Two-level Thermal Storage Implemented with Control System

HURDLES:

- 0Learn Dymola
- Learn About OPC Connection
- Implement and create a perfect model with Dymola
- Extract information using Created Model From Matlab
- Proper Formulation required for that

Legends :

✔️ **: Done**

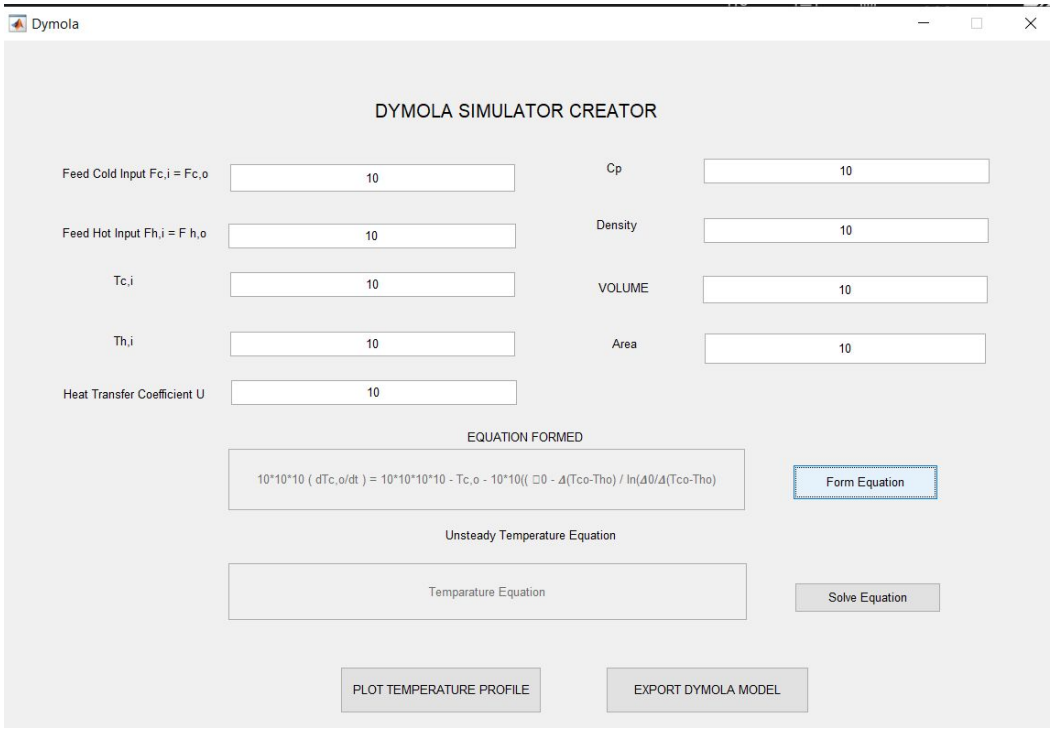
❌ **: Failed Attempts**

🎡 **: Progress**

: NOT Started Yet

7th OCT 2020-25th OCT 2020:✔️

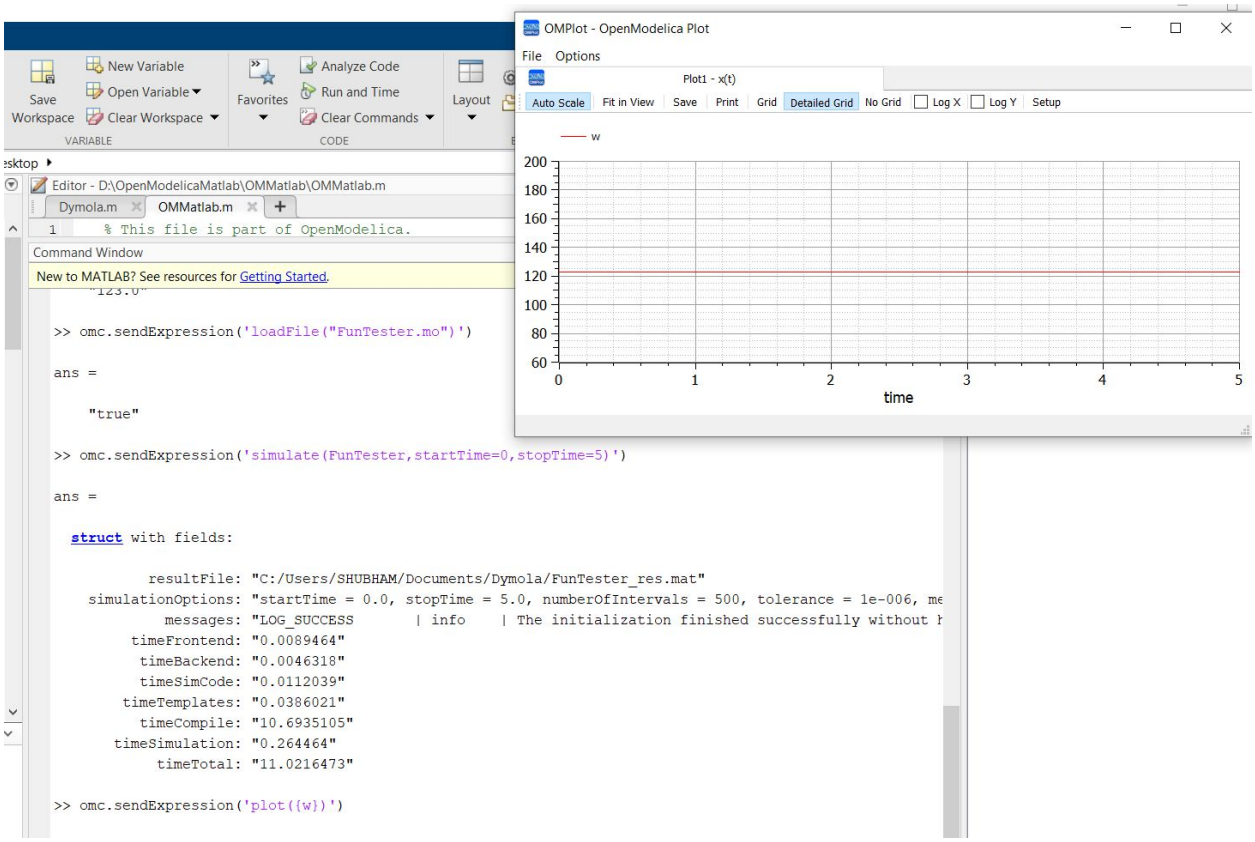
- Installed and Experimented Dymola ✔️
- Installed MATLAB ✔️
- Revising Concepts Again [Till Transfer Function] ✔️
- Create a simple MATLAB GUI MODEL with Laplace solver and plotter ✔️
- Seeing videos OPENMODELICA / Dymola: OpenModelica@SpokenTutorial ✔️
- Learn about Matlab OPC Connection ✔️
- Create a simple Matlab GUI Interface with EXPORT of Dummy Dymola file ✔️



(PLEASE PROVIDE FEEDBACKS OR IF ANY CHANGES REQUIRED..)

25th OCT 2020-30th OCT 2020:✔️

- **BASIC CONNECTION BETWEEN DYMOLA AND MATLAB SUCCESSFUL**
- **ABLE TO COMMUNICATE USING MATLAB**



30th OCT 2020-10th NOV 2020: ✔

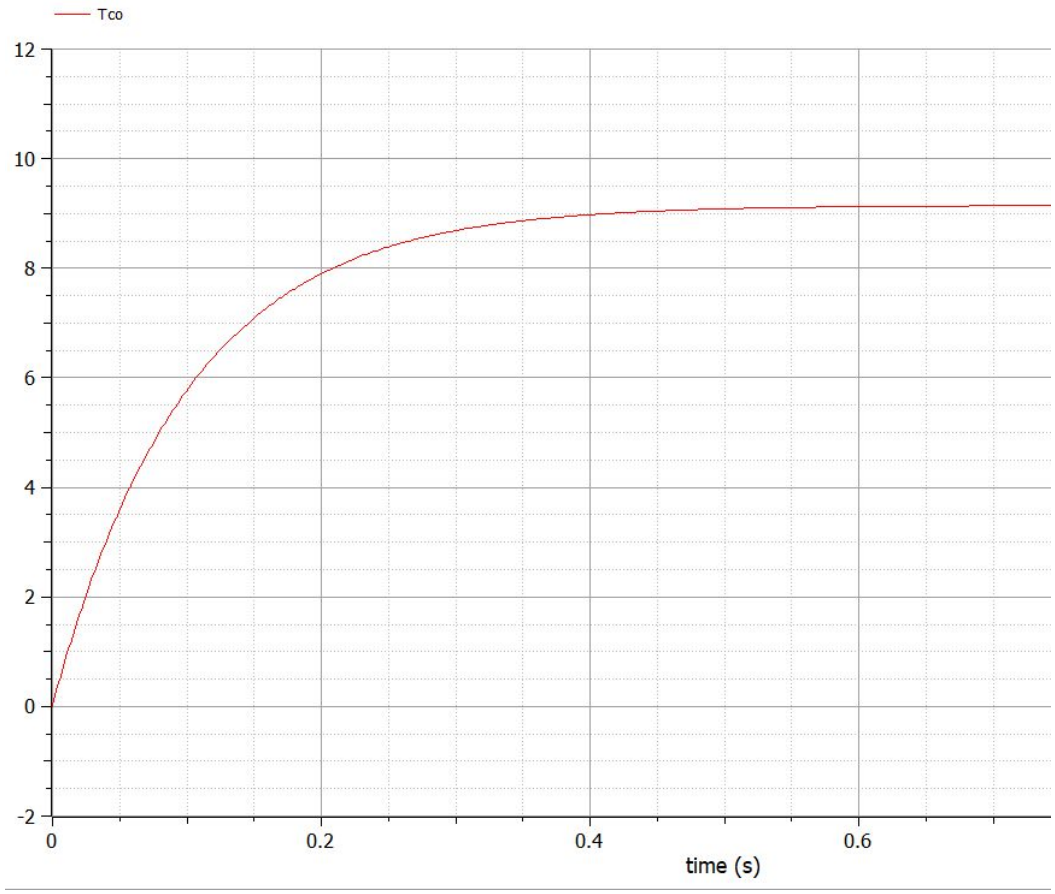
- **OPC MODEL AND BETTER COMMUNICATION**
- **PROGRAMMING**

```
model FluidWORKING
  parameter Real Fci(unit = "kg/h")=100 "Feed cold in/out";
  parameter Real Fhi(unit = "kg/h")=50 "Feed hot in/out";
  parameter Real Tci(unit = "K")=10 "Temp cold in";
  parameter Real Thi(unit = "K")=100 "Temp hot in";
  parameter Real Tho(unit = "K")=90 "Temp hot out";
  parameter Real U(unit = "kg/Km^2s^2")=10 "Heat transfer coefficient";
  parameter Real Area(unit = "m^2")=10 "Area";
  parameter Real Volume(unit = "m^3")=10 "Volume";
  parameter Real Density(unit = "kg/m^3")=10 "Density";
  parameter Real Cp(unit = "Jkg^-1K-1")=10 "Specific Heat";

  Real Tco;
equation
  der(Tco)=(Fci*Cp*Density*(Tci-Tco)-U*Area*((Thi-Tci)-(Tho-Tco))/log((Thi-Tci)/(Tho-Tco)))/(Volume*Cp*Density);

end FluidWORKING;
```

- **Run this using Matlab overriding values**
- **Plot Graph Tco**



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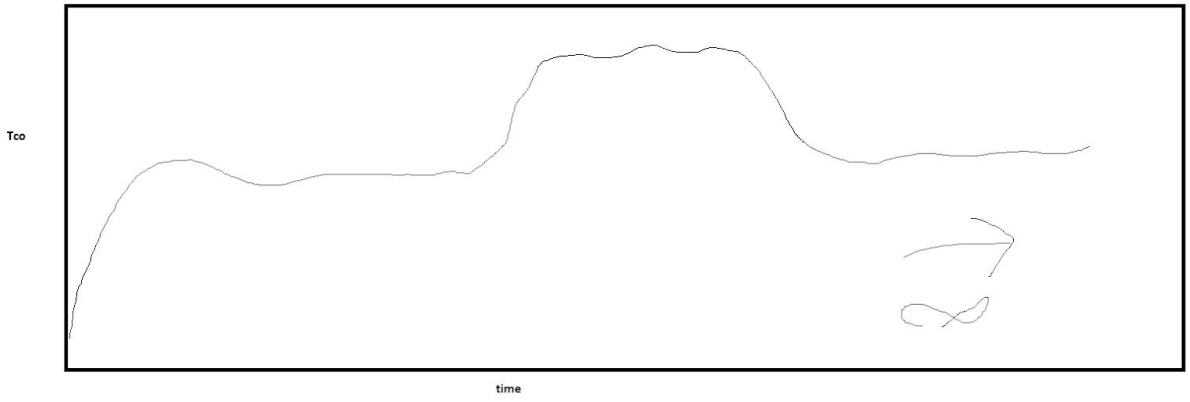
<u>11th NOV 2020-3th NOV 2020:</u>



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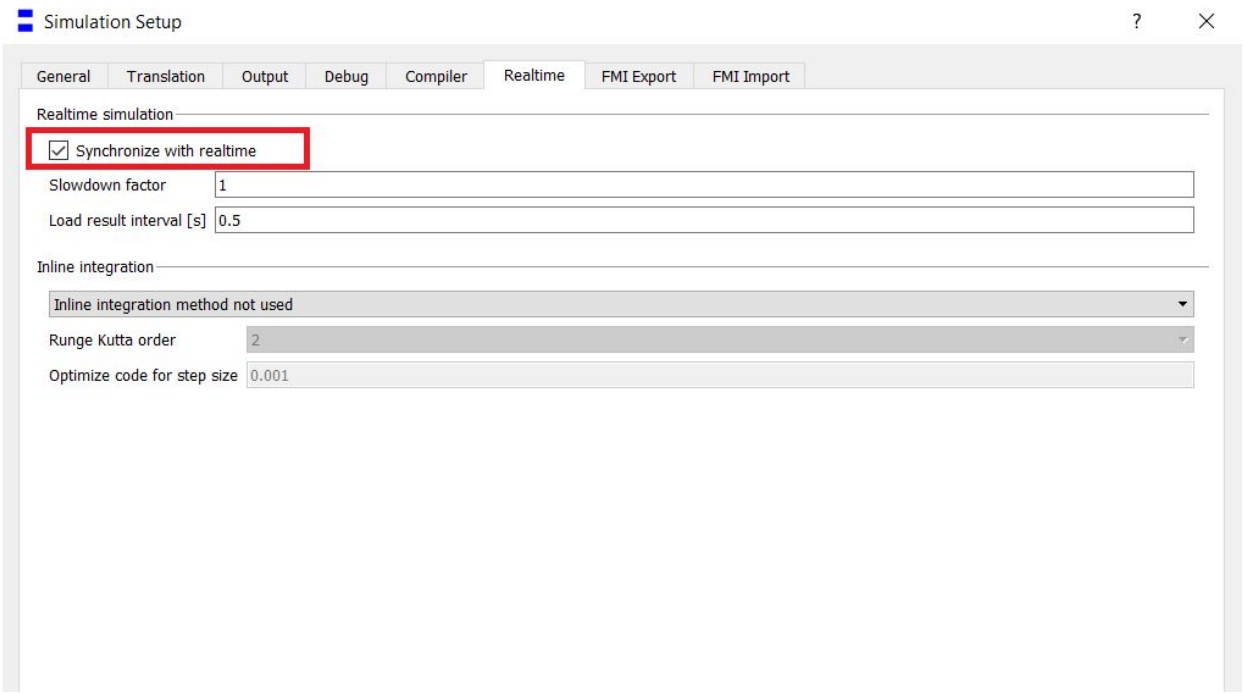
- **Dymola**
- **Convert static into Realtime Simulation infinite time loop**



- **FInally OPC server problem solved using VS2012**
- **Finally Created a working program code using MATLAB**

- **TO CONNECT**

```
hostInfo = opcserverinfo('localhost');
da = opcda('localhost','Dymosim.OPCServer.1');
connect(da);
fprintf("CONNECTED\n");
```

- **TO CREATE GROUP**

```
grp=addgroup(da,'Demo');
grp2=addgroup(da,'Demo2');
```

- **Easy Visulaiztaion using opctool command in MATLAB**

```
tScale=additem(grp2,{'SimControl.tScale'});
Time=additem(grp2,{'SimControl.Time'});
Realtime=additem(grp2,{'SimControl.Realtime'});
Initialize=additem(grp2,{'SimControl.Initialize'});
Run=additem(grp2,{'SimControl.Run'});
Status=additem(grp2,{'SimControl.Status'});
Stop=additem(grp2,{'SimControl.Stop'});
Pause=additem(grp2,{'SimControl.Pause'});
```

- **TO INITIALIZE**

```
write(Initialize,1);
pause(2);
```

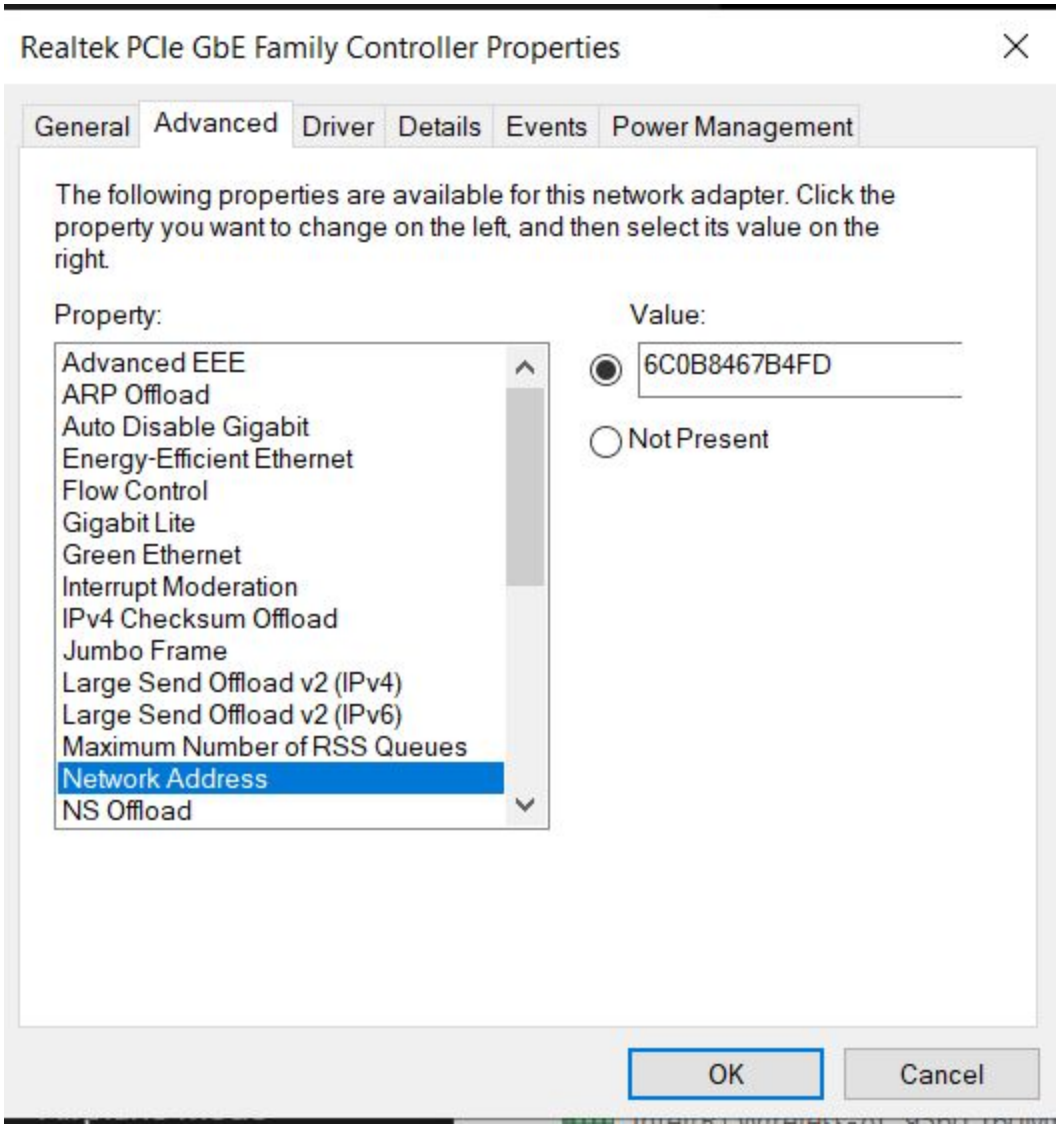
- **ADD TO GROUPS**

```
itmIDs={'ModelVariables.Tco','ModelVariables.der(Tco)'};
itm=additem(grp,itmIDs);
area=additem(grp,{'ModelVariables.Area'});
volume=additem(grp,{'ModelVariables.Volume'});
density=additem(grp,{'ModelVariables.Density'});
cp=additem(grp,{'ModelVariables.Cp'});
Fci=additem(grp,{'ModelVariables.Fci'});
Fhi=additem(grp,{'ModelVariables.Fhi'});
Tci=additem(grp,{'ModelVariables.Tci'});
Thi=additem(grp,{'ModelVariables.Thi'});
Tho=additem(grp,{'ModelVariables.Tho'});


set(grp,'UpdateRate',0.2,'RecordsToAcquire',50);


write(Run,1);

start(grp);
wait(grp);

fprintf("LOGGING\n");


[logIDs,Tco]=getdata(grp,'double');
write(area,23);
NEWTco=read(itm,'device').Value;
```

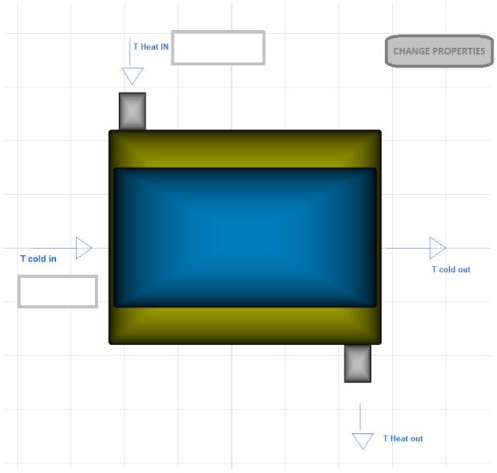
- **TO SETUP LICENCE**
- **See HOST ID**

```
# License number 15510
#
# INDIAN INSTITUTE OF TECHNOLOGY _ GUWAHATI
#
# Academic Innovate License
#
# File created 14-Sep-2020 14:00:30
#
FEATURE DymolaStandard dynasim 1.000 11-sep-2025 uncounted \
    611AC2D7E908 VENDOR_STRING="INDIAN INSTITUTE OF TECHNOLOGY _ \
    GUWAHATI" HOSTID=6c0b8467b4fd ISSUER="Dynasim AB" SN=15510 \
    START=13-Sep-2020 SIGN="0113 7262 B4A4 3736 BBDD 228C 3E82 \
    0BEE DAC9 AF53 7C02 4B08 7799 6B75 F771 3389 88F8 1FCB BBE5 \
    3DCF 05DF"
#
```

- **Open NETWORK ADAPTER**



- **SELECT LIC FILE**



CHANGE PROPERTIES

DYMOLA SIMULATOR

Feed Cold Fci = Fco	240	CHNG	Specific Heat(Cp)	150	CHNG
Feed Hot Fh,i = Fh,o	70	CHNG	Density(ρ)	10	CHNG
Temperature Cold In (Tci)	80	CHNG	Volume(V)	5	CHNG
Temperature Hot In(Thi)	215	CHNG	Area(A)	200	CHNG
			Heat Transfer Coeff(U)	2000	CHNG

write(U,U_val);

time — Displays Time

INITIALIZE | PLOT AND SIMULATE | Start | Stop | Pause

SET ALL VALUES AND INITIALIZES

plots

write(Pause,1)