## Supporting Information

Dynamic simulation details and additional figures (Figures S1-S16).

**Figure S1.**

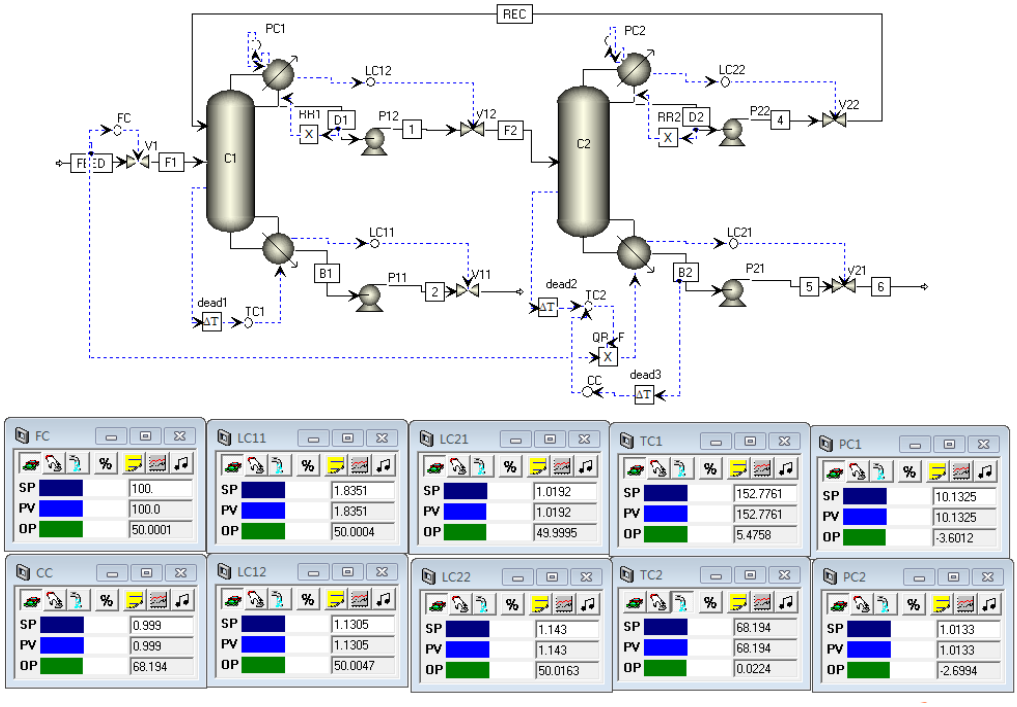


**Figure S2.**

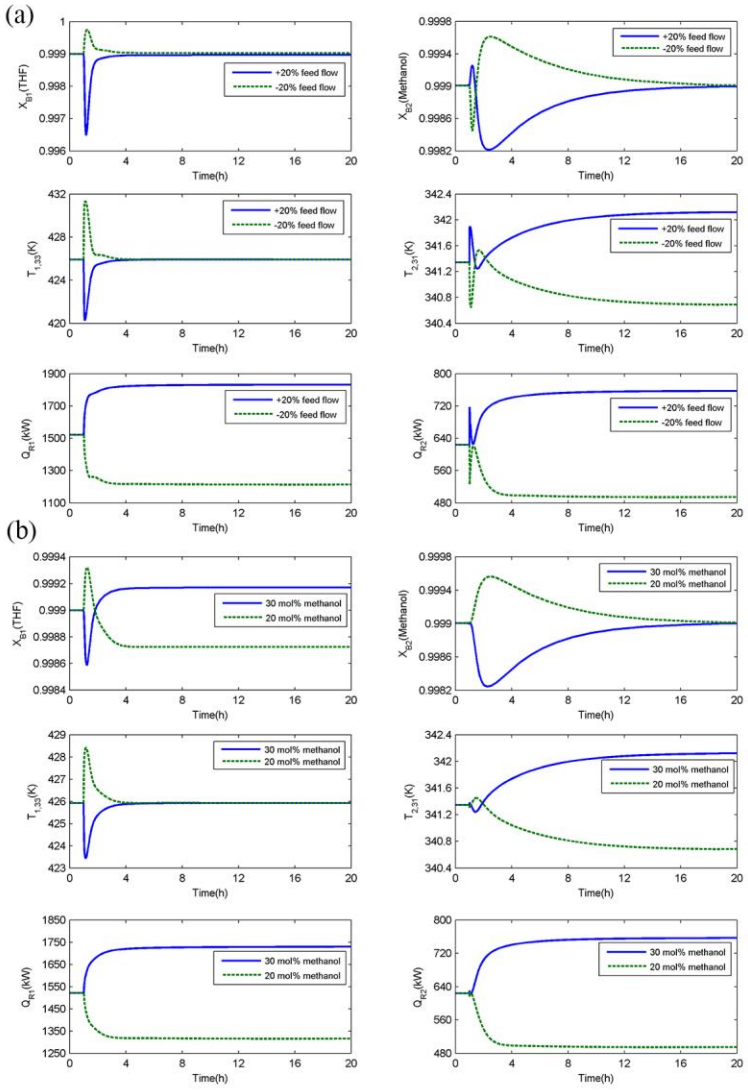

(a)
+20% feed flow
-20% feed flow
Time(h)
(b)
30 mol% methanol
20 mol% methanol
Time(h)

**Figure S3.**

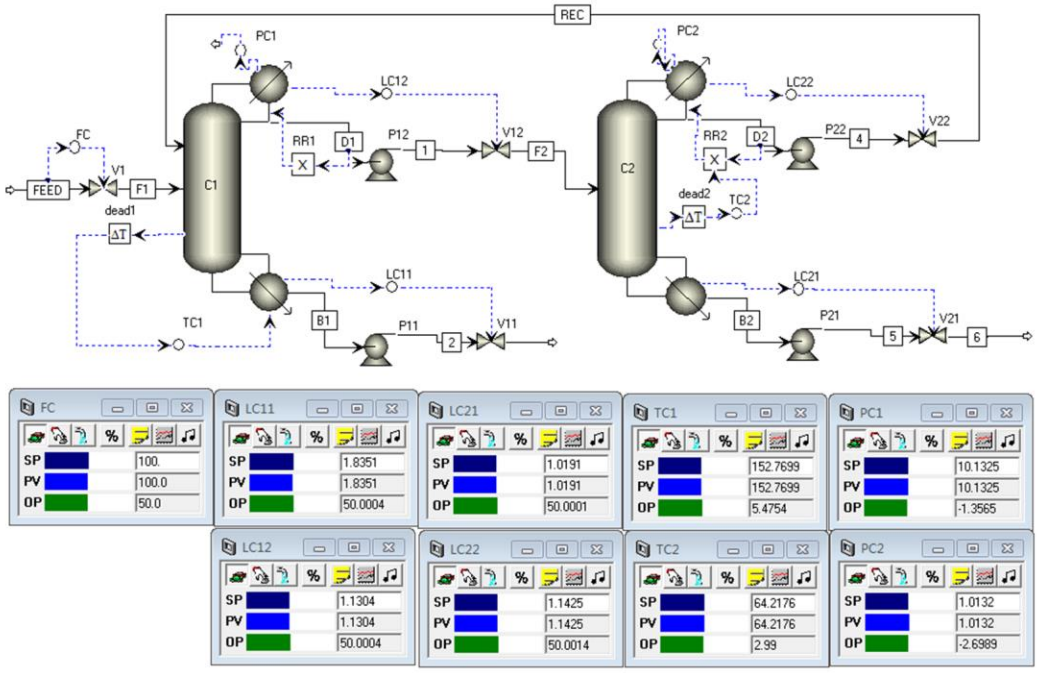
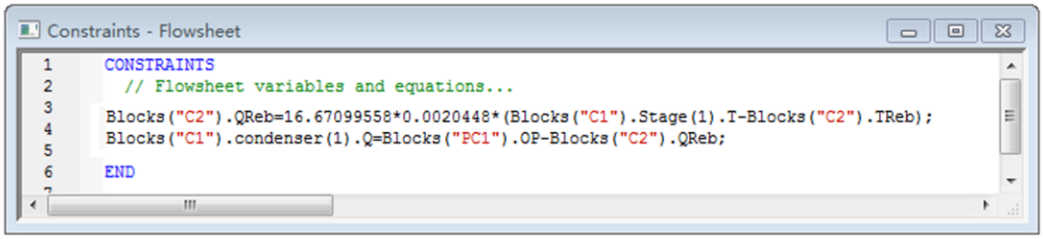
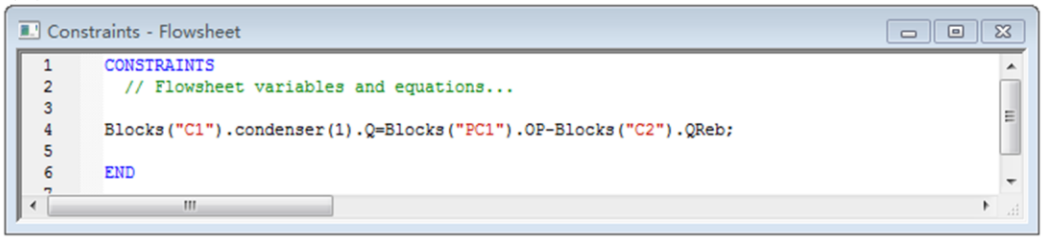

REC
PC1
PC2
LC12
LC22
FC
RR1
D1
P12
1
V12
F2
RR2
D2
P22
4
V22
FEED
V1
F1
C1
C2
dead1
dead2
ΔT
TC2
LC11
LC21
TC1
B1
P11
2
V11
B2
P21
5
V21
6
FC
SP 100.
PV 100.0
OP 50.0
LC11
SP 1.8351
PV 1.8351
OP 50.0004
LC21
SP 1.0191
PV 1.0191
OP 50.0001
TC1
SP 152.7699
PV 152.7699
OP 5.4754
PC1
SP 10.1325
PV 10.1325
OP -1.3565
LC12
SP 1.1304
PV 1.1304
OP 50.0004
LC22
SP 1.1425
PV 1.1425
OP 50.0014
TC2
SP 64.2176
PV 64.2176
OP 2.99
PC2
SP 1.0132
PV 1.0132
OP -2.6989

**Figure S4.**

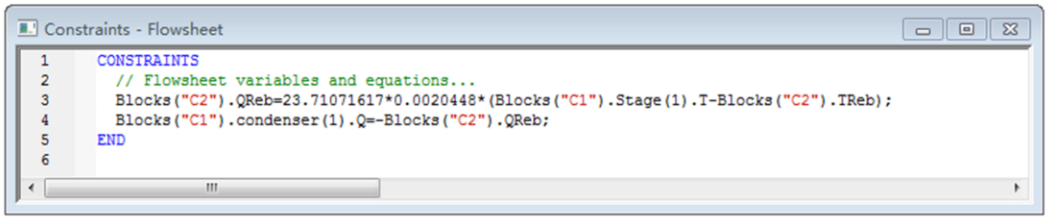
(a)




(b)




(c)




(d)

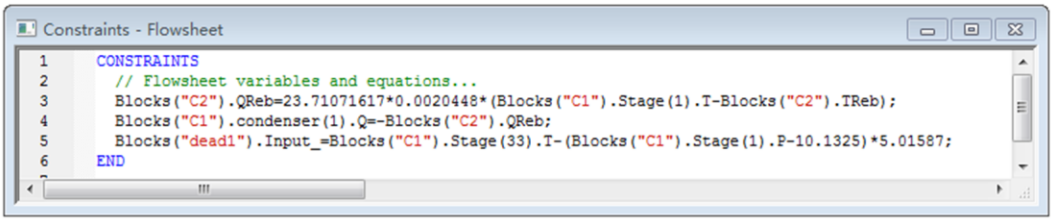


**Figure S5.**

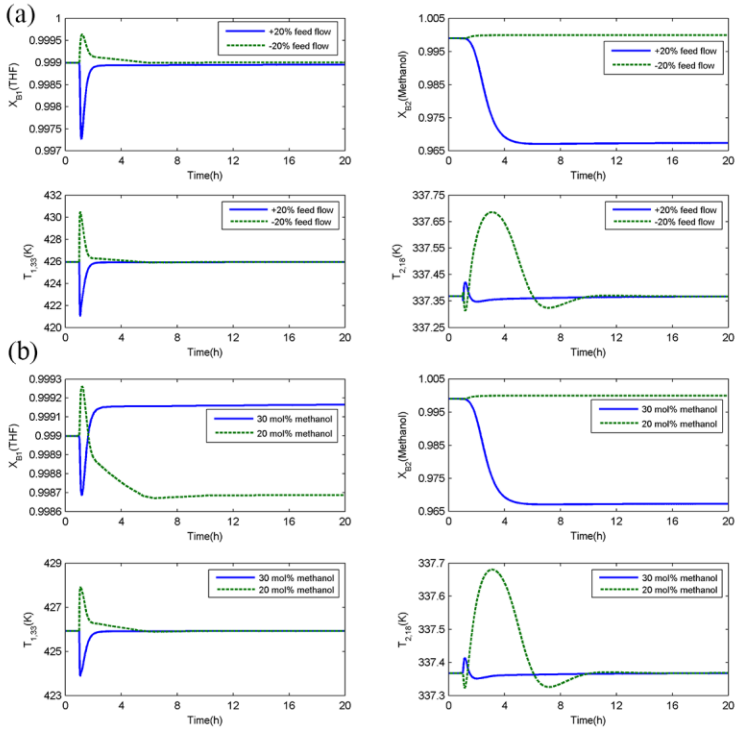

(a)
+20% feed flow
-20% feed flow
$X_{B1}$(THF)
$X_{B2}$(Methanol)
$T_{1,33}$(K)
$T_{2,16}$(K)
Time(h)
(b)
30 mol% methanol
20 mol% methanol
$X_{B1}$(THF)
$X_{B2}$(Methanol)
$T_{1,33}$(K)
$T_{2,16}$(K)
Time(h)

**Figure S6.**

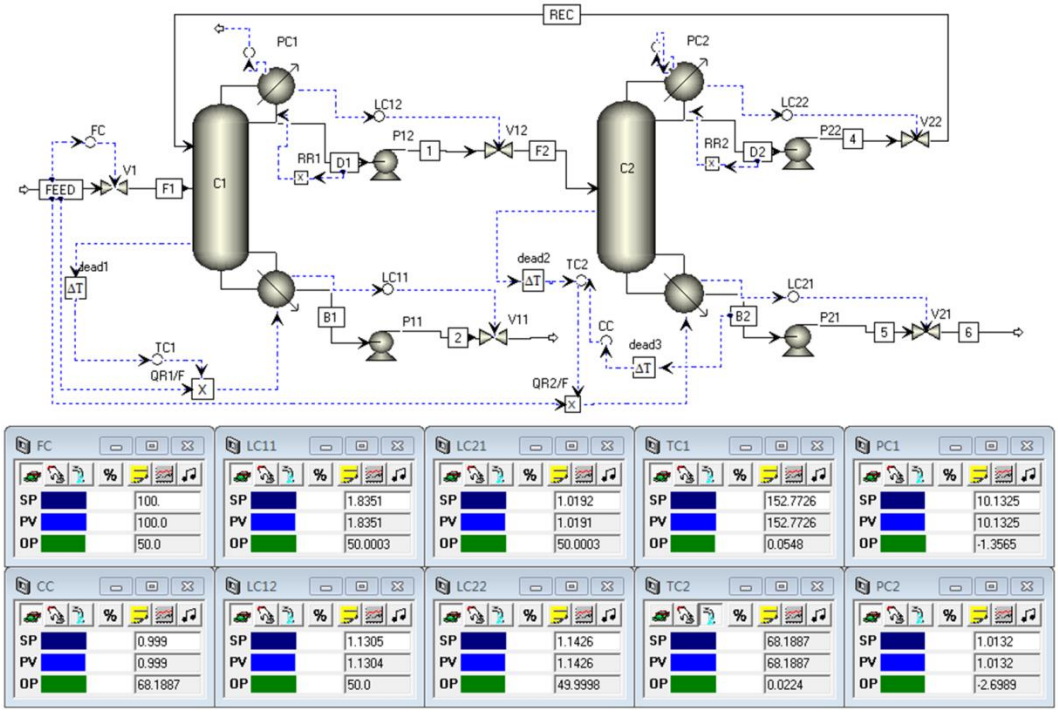

REC
PC1
PC2
LC12
LC22
FC
V1
FEED
F1
C1
RR1
D1
P12
1
V12
F2
C2
RR2
D2
P22
4
V22
dead1
ΔT
LC11
dead2
TC2
LC21
B1
P11
2
V11
CC
dead3
B2
P21
5
V21
6
TC1
QR1/F
X
QR2/F
FC
SP 100.
PV 100.0
OP 50.0
LC11
SP 1.8351
PV 1.8351
OP 50.0003
LC21
SP 1.0192
PV 1.0191
OP 50.0003
TC1
SP 152.7726
PV 152.7726
OP 0.0548
PC1
SP 10.1325
PV 10.1325
OP -1.3565
CC
SP 0.999
PV 0.999
OP 68.1887
LC12
SP 1.1305
PV 1.1304
OP 50.0
LC22
SP 1.1426
PV 1.1426
OP 49.9998
TC2
SP 68.1887
PV 68.1887
OP 0.0224
PC2
SP 1.0132
PV 1.0132
OP -2.6989

**Figure S7.**

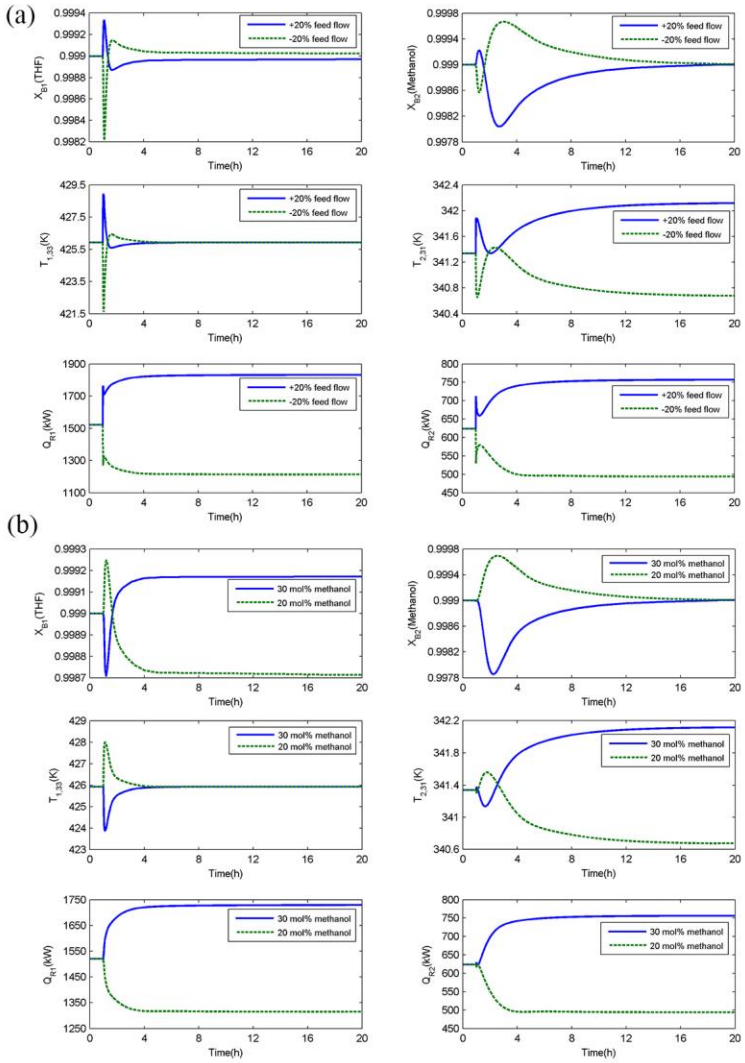

(a)
+20% feed flow
-20% feed flow
Time(h)
(b)
30 mol% methanol
20 mol% methanol
Time(h)

**Figure S8.**

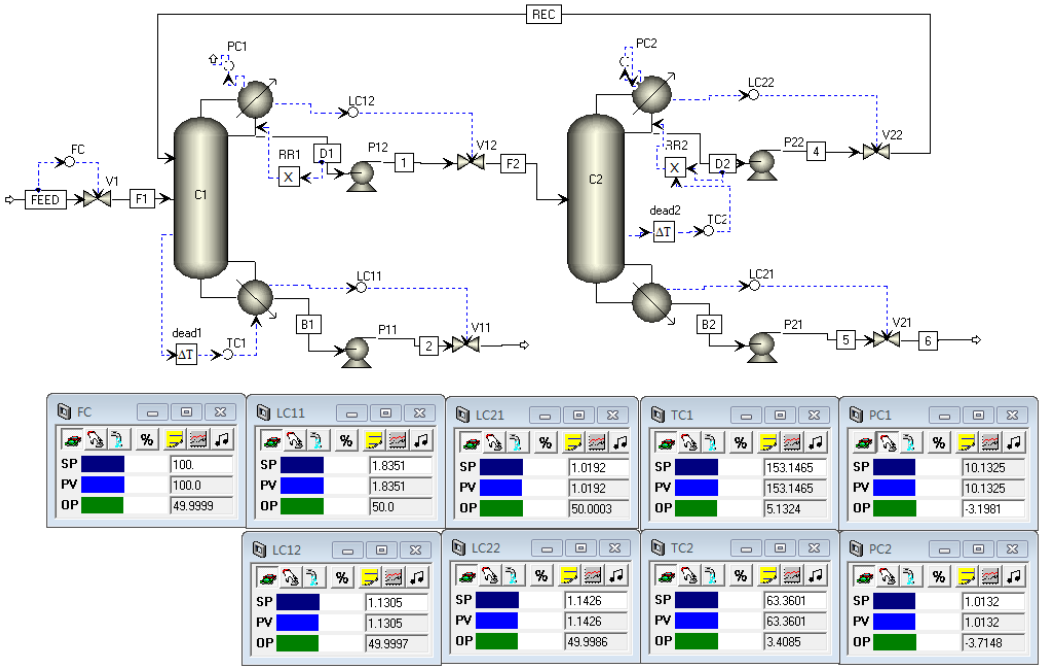

REC
PC1
PC2
LC12
LC22
FC
V1
FEED
F1
C1
RR1
D1
P12
1
V12
F2
C2
RR2
D2
P22
4
V22
dead2
TC2
LC11
LC21
B1
B2
P11
2
V11
P21
5
V21
6
dead1
TC1
FC
SP
PV
OP
100.
100.0
49.9999
LC11
1.8351
1.8351
50.0
LC21
1.0192
1.0192
50.0003
TC1
153.1465
153.1465
5.1324
PC1
10.1325
10.1325
-3.1981
LC12
1.1305
1.1305
49.9997
LC22
1.1426
1.1426
49.9986
TC2
63.3601
63.3601
3.4085
PC2
1.0132
1.0132
-3.7148

**Figure S9.**

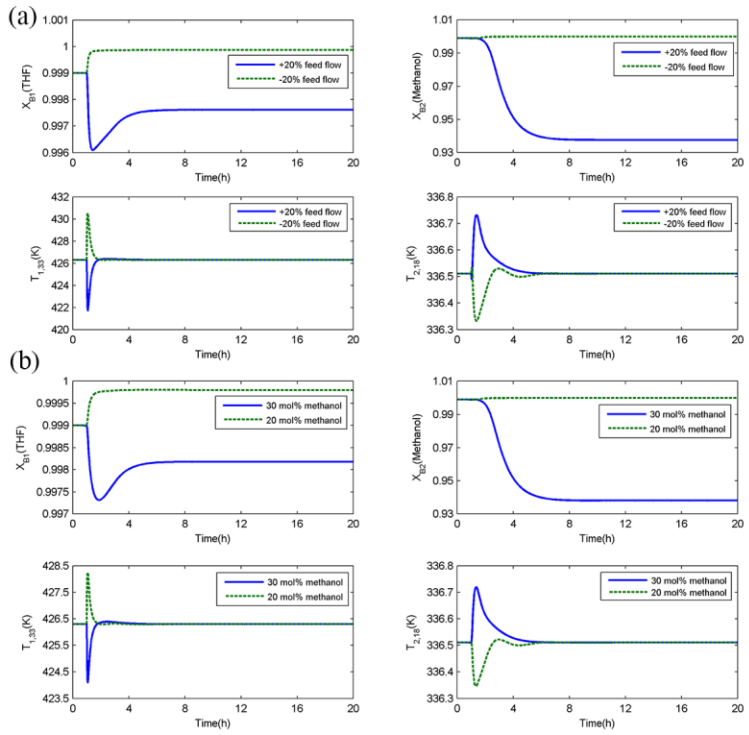

(a)
+20% feed flow
-20% feed flow
Time(h)
(b)
30 mol% methanol
20 mol% methanol
Time(h)

**Figure S10.**

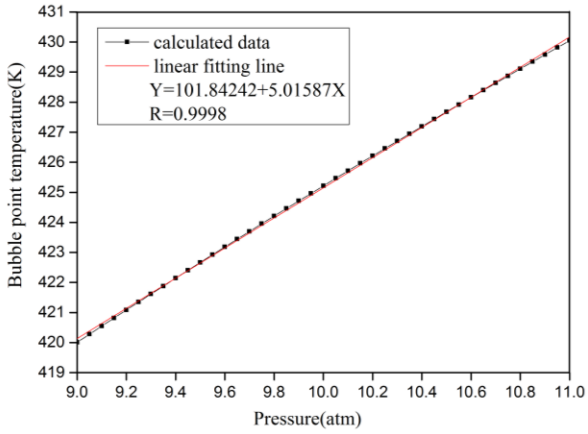

calculated data
linear fitting line
Y=101.84242+5.01587X
R=0.9998
Bubble point temperature(K)
Pressure(atm)
431
430
429
428
427
426
425
424
423
422
421
420
419
9.0
9.2
9.4
9.6
9.8
10.0
10.2
10.4
10.6
10.8
11.0

**Figure S11.**

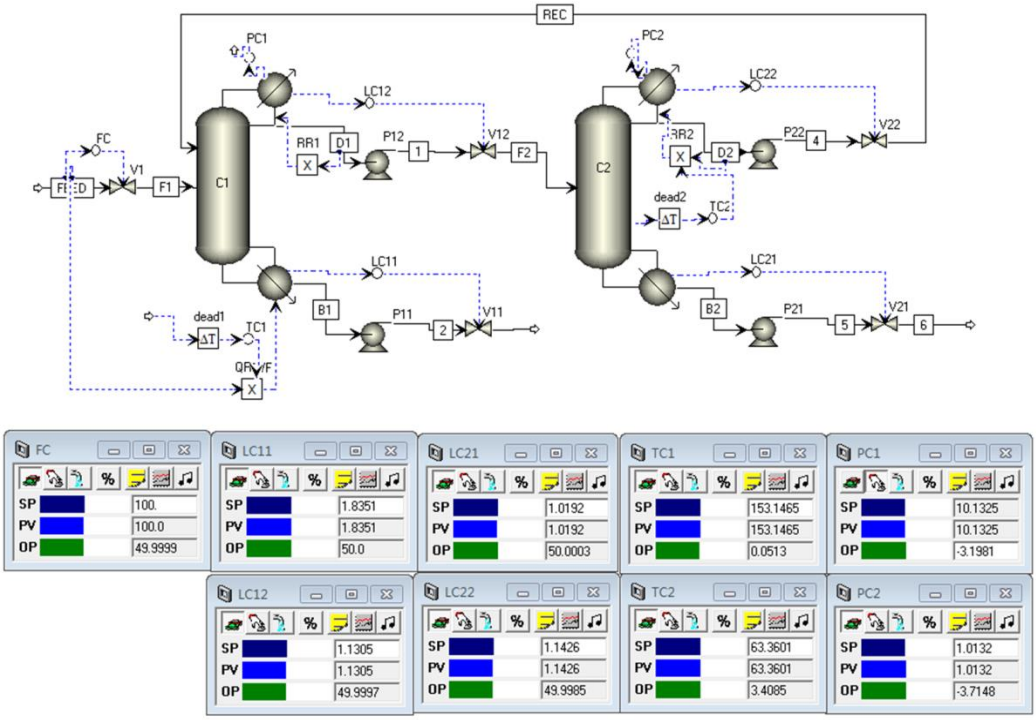

REC
PC1
PC2
LC12
LC22
FC
V1
RR1
D1
P12
1
V12
F2
C1
C2
RR2
D2
P22
4
V22
dead2
TC2
LC11
LC21
B1
P11
2
V11
B2
P21
5
V21
6
dead1
TC1
QR
VF
X
FC
SP 100.
PV 100.0
OP 49.9999
LC11
SP 1.8351
PV 1.8351
OP 50.0
LC21
SP 1.0192
PV 1.0192
OP 50.0003
TC1
SP 153.1465
PV 153.1465
OP 0.0513
PC1
SP 10.1325
PV 10.1325
OP -3.1981
LC12
SP 1.1305
PV 1.1305
OP 49.9997
LC22
SP 1.1426
PV 1.1426
OP 49.9985
TC2
SP 63.3601
PV 63.3601
OP 3.4085
PC2
SP 1.0132
PV 1.0132
OP -3.7148

**Figure S12.**

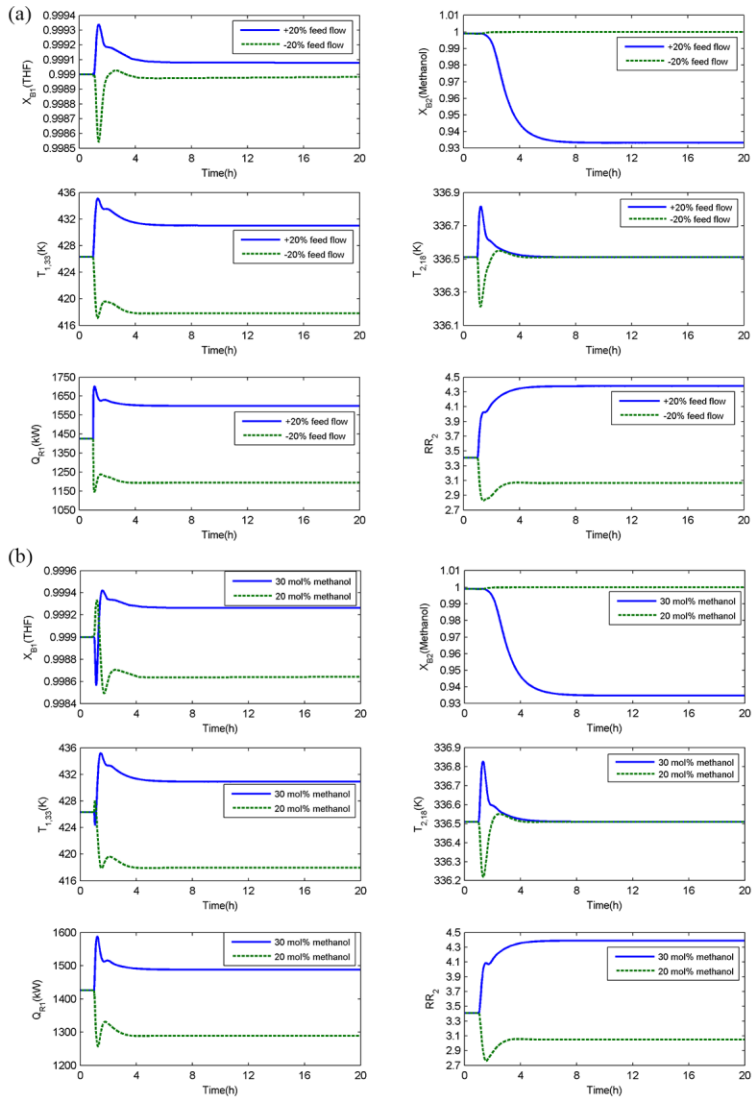

(a)
+20% feed flow
-20% feed flow
$X_{B1}$(THF)
$X_{B2}$(Methanol)
$T_{1,33}$(K)
$T_{2,18}$(K)
$Q_{R1}$(kW)
$RR_2$
Time(h)
(b)
30 mol% methanol
20 mol% methanol
$X_{B1}$(THF)
$X_{B2}$(Methanol)
$T_{1,33}$(K)
$T_{2,18}$(K)
$Q_{R1}$(kW)
$RR_2$
Time(h)

**Figure S13.**

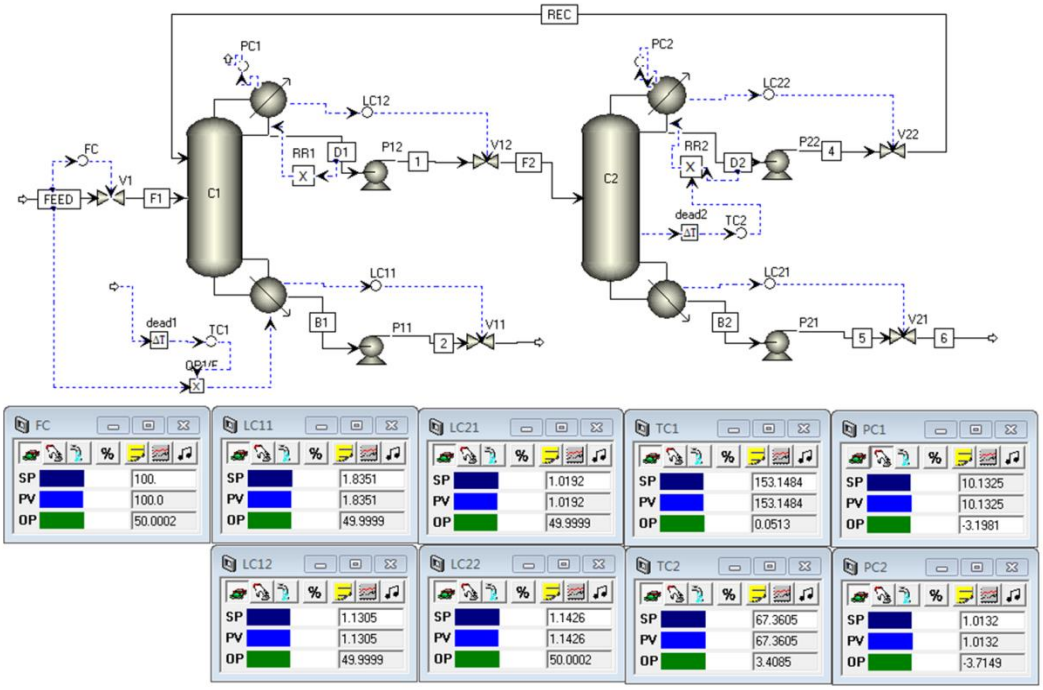

REC
PC1
PC2
LC12
LC22
FC
V1
FEED
F1
C1
RR1
D1
P12
1
V12
F2
C2
RR2
D2
P22
4
V22
dead2
TC2
LC11
LC21
dead1
TC1
B1
P11
2
V11
B2
P21
5
V21
6
FC
SP 100.
PV 100.0
OP 50.0002
LC11
SP 1.8351
PV 1.8351
OP 49.9999
LC21
SP 1.0192
PV 1.0192
OP 49.9999
TC1
SP 153.1484
PV 153.1484
OP 0.0513
PC1
SP 10.1325
PV 10.1325
OP -3.1981
LC12
SP 1.1305
PV 1.1305
OP 49.9999
LC22
SP 1.1426
PV 1.1426
OP 50.0002
TC2
SP 67.3605
PV 67.3605
OP 3.4085
PC2
SP 1.0132
PV 1.0132
OP -3.7149

**Figure S14.**

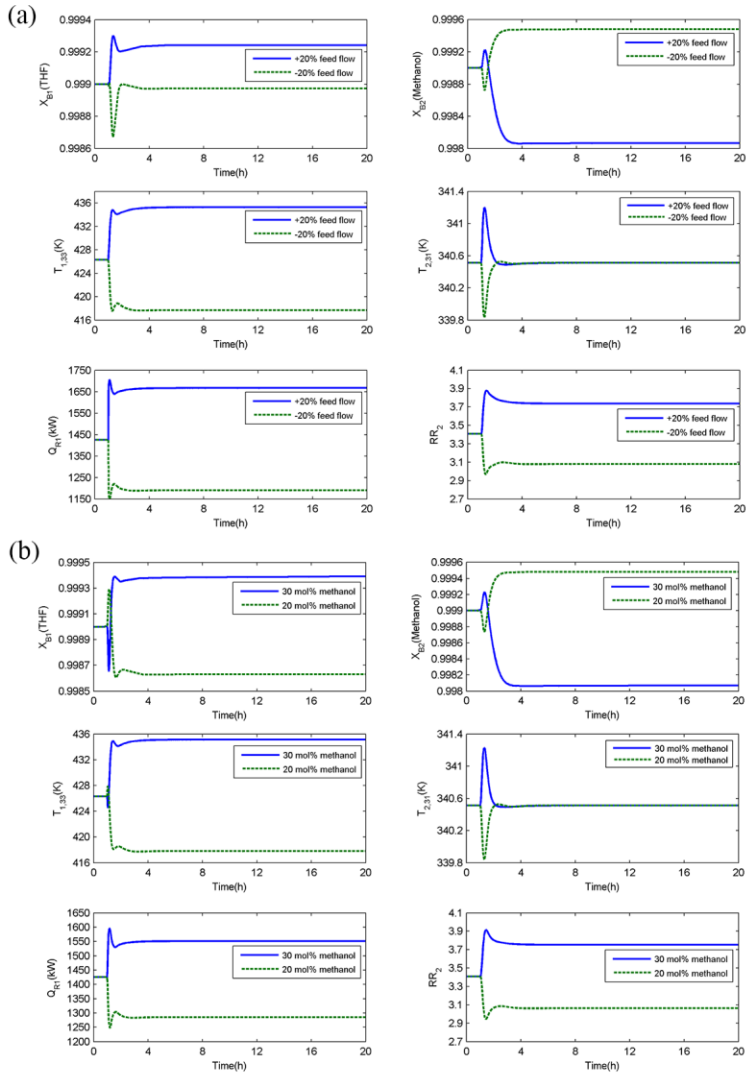

(a)
+20% feed flow
-20% feed flow
Time(h)
(b)
30 mol% methanol
20 mol% methanol
Time(h)

**Figure S15.**

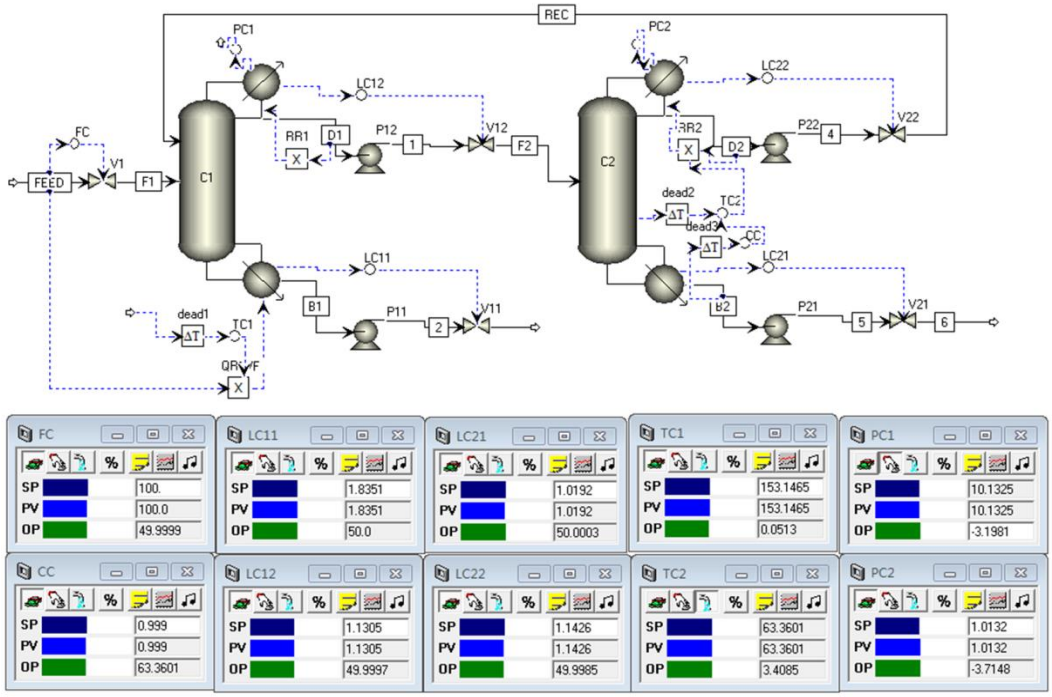

REC
PC1
PC2
LC12
LC22
FC
V1
FEED
F1
C1
RR1
D1
P12
1
V12
F2
C2
RR2
D2
P22
4
V22
dead2
TC2
dead3
CC
LC11
LC21
B1
P11
2
V11
B2
P21
5
V21
6
dead1
TC1
QR
F
FC
SP 100.
PV 100.0
OP 49.9999
LC11
SP 1.8351
PV 1.8351
OP 50.0
LC21
SP 1.0192
PV 1.0192
OP 50.0003
TC1
SP 153.1465
PV 153.1465
OP 0.0513
PC1
SP 10.1325
PV 10.1325
OP -3.1981
CC
SP 0.999
PV 0.999
OP 63.3601
LC12
SP 1.1305
PV 1.1305
OP 49.9997
LC22
SP 1.1426
PV 1.1426
OP 49.9985
TC2
SP 63.3601
PV 63.3601
OP 3.4085
PC2
SP 1.0132
PV 1.0132
OP -3.7148

**Figure S16.**

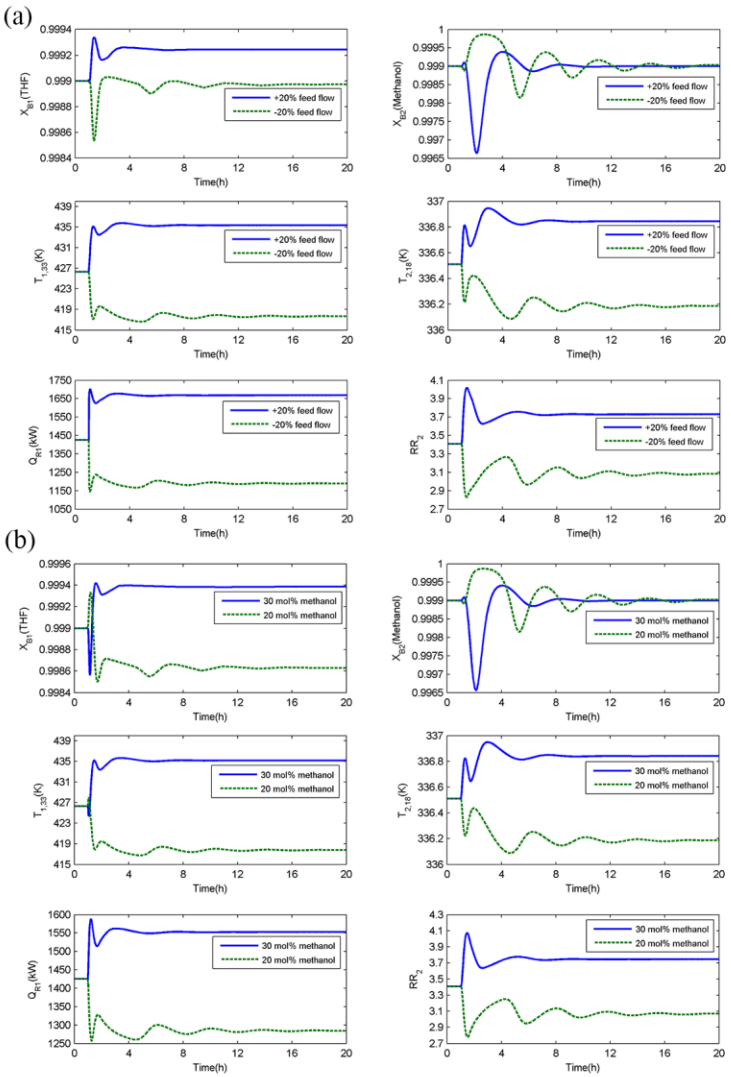

(a)
+20% feed flow
-20% feed flow
Time(h)
(b)
30 mol% methanol
20 mol% methanol
Time(h)

**Figure captions**

**Figure S1.** The composition/temperature cascade control structure for the PSD process without heat integration when stage 31 in LPC is selected as control stage.

**Figure S2.** Dynamic responses for the composition/temperature cascade control structure for the process PSD without heat integration when stage 31 in LPC is selected as control stage: feed flow rate and feed composition disturbances.

**Figure S3.** Basic temperature control structure for the PSD process with partial heat integration.

**Figure S4.** Aspen Plus Dynamic flowsheet equations: (a) for partial heat integration; (b) modified control structure for partial heat integration; (c) for full heat integration; (d) of the pressure–compensated temperature control structure for full heat integration.

**Figure S5.** Dynamic responses for the basic control structure for the PSD with partial heat integration: feed flow rate and feed composition disturbances.

**Figure S6.** The improved composition/temperature cascade control structure for the PSD process with partial heat integration when stage 31 in LPC is selected as control stage.

**Figure S7.** Dynamic responses for the improved composition/temperature cascade control structure for the PSD with partial heat integration when stage 31 in LPC is selected as control stage: feed flow rate and feed composition disturbances.

**Figure S8.** Basic temperature control structure for the PSD process with full heat integration.

**Figure S9.** Dynamic responses for the basic temperature cascade control structure for the PSD with full heat integration: feed flow rate and feed composition disturbances.

**Figure S10.** Effect of system pressure on bubble point temperature of liquid mixture for stage 33 of the HPC.

**Figure S11.** The pressure-compensated temperature control structure for the PSD with full heat integration when stage 18 in LPC is selected as control stage.

**Figure S12.** Dynamic responses for the pressure–compensated temperature control structure for the PSD with full heat integration when stage 18 in LPC is selected as control stage: feed flow rate and feed composition disturbances.

**Figure S13.** The pressure–compensated temperature control structure for the PSD with full heat integration when stage 31 in LPC is selected as control stage.

**Figure S14.** Dynamic responses for the pressure–compensated temperature control structure for

the PSD with full heat integration when stage 31 in LPC is selected as control stage: feed flow rate and feed composition disturbances.

**Figure S15.** The improved pressure–compensated temperature control structure for the PSD with full heat integration when stage 18 in LPC is selected as control stage.

**Figure S16.** Dynamic responses for the improved pressure–compensated temperature control structure for the PSD with full heat integration when stage 18 in LPC is selected as control stage: feed flow rate and feed composition disturbances.