

---

# ISS(Isotope Separation System)

## 초저온증류 공정시뮬레이션

공주대학교 화학공학부

조 정 호

---

# 목 차

1. ISS(Isotope Separation System) 소개
2. ITER ISS 평형 반응기
3. 헬륨 냉동 사이클
4. Pure Component Properties
5. ITER ISS 공정 시뮬레이션 Case 1
6. ITER ISS 공정 시뮬레이션 Case 2
7. ITER ISS 공정 시뮬레이션 Case 3

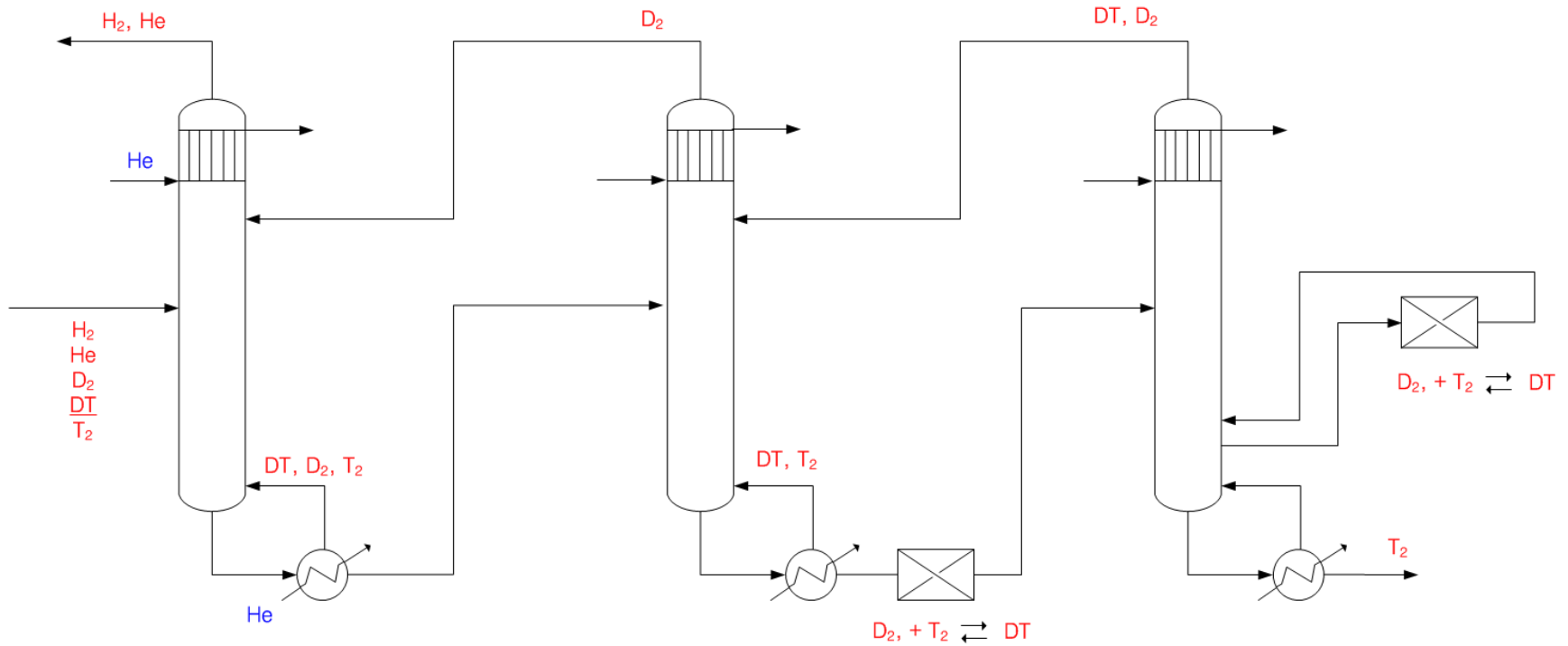
---

# 7. ITER ISS 공정 시뮬레이션

## Case 3

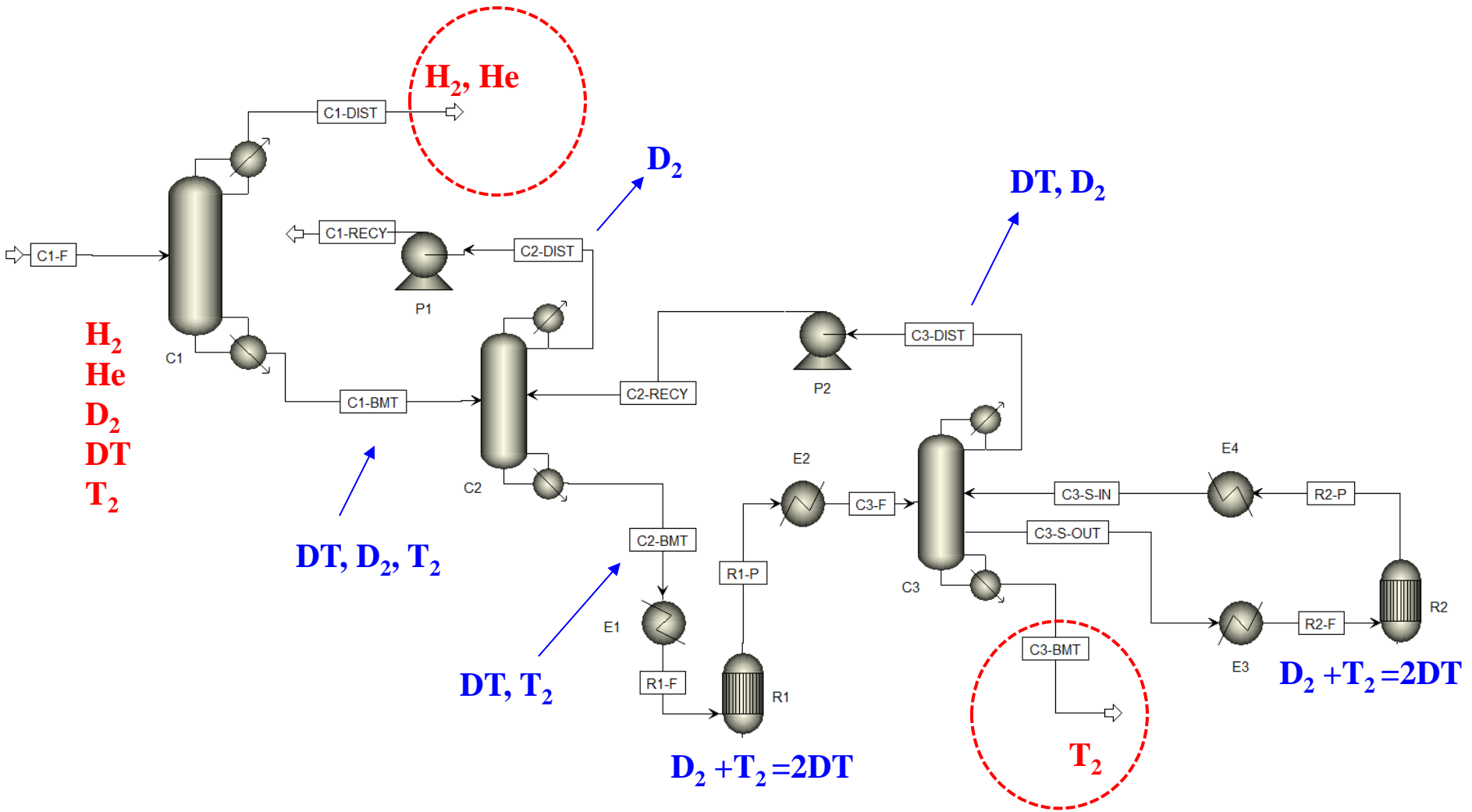
# 7. ITER ISS 공정 시뮬레이션 Case 3

## ISS(Isotope Separation System)\_Case 03(월성 공정)



월성으로부터 주요 부분의 공정 물질 수지를 받기로 함. → 프로그램에 대한 결과 검증 수행 진행

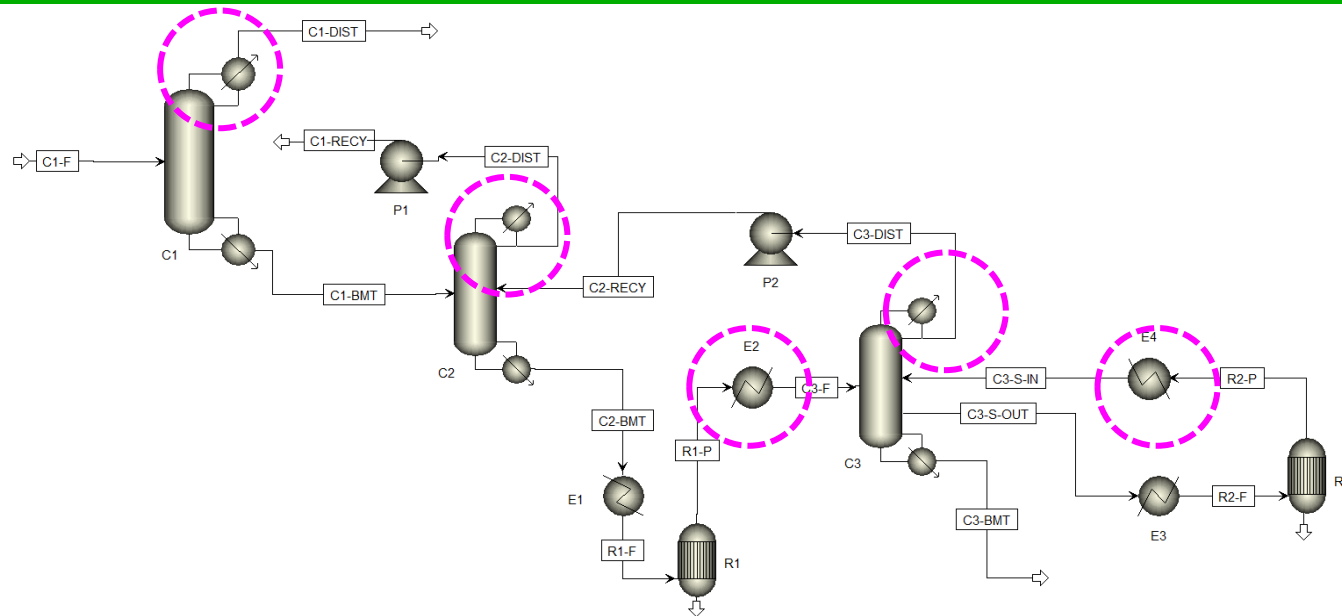
# 7. ITER ISS 공정 시뮬레이션 Case 3



# 7. ITER ISS 공정 시뮬레이션 Case 3

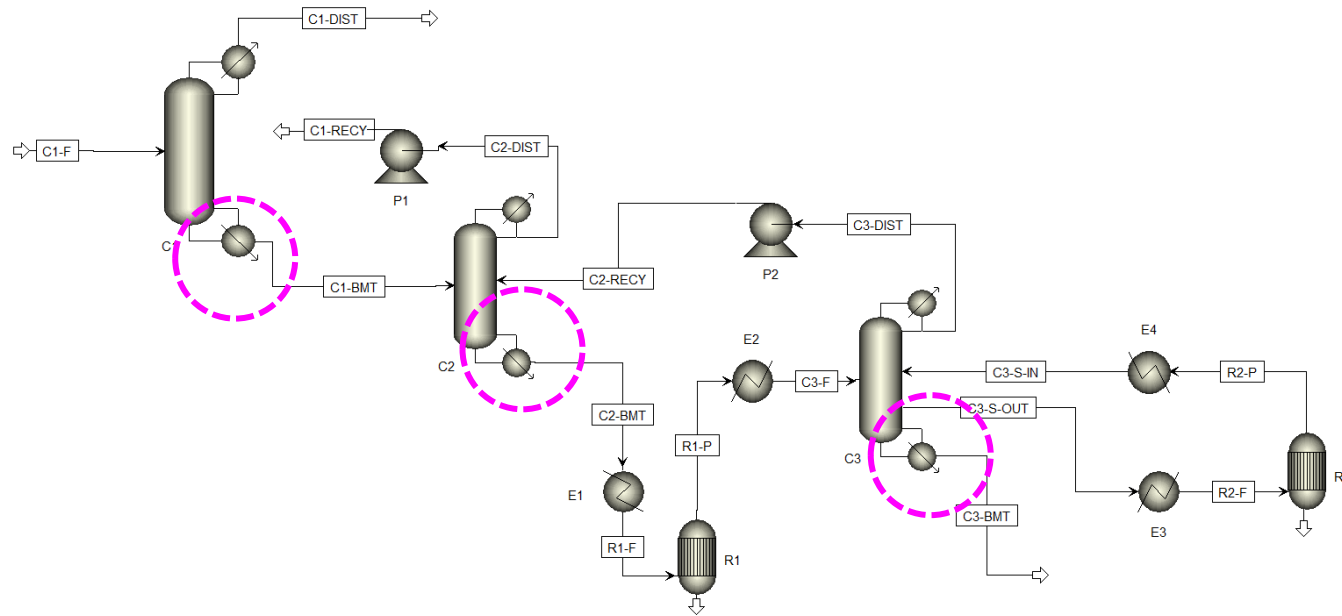
Stream Number	C1-F		C1-DIST		C1-RECY		C3-BMT	
Stream Name	Feed		C1 column top		C1 column recycle		C1 column bottom	
Temperature (K)	30.00		21.64		24.06		23.54	
Pressure (atm)	1.48		1.28		2.00		0.70	
Vapor Frac	1.00		1.00		0.00		0.00	
Mole Flow (mol/min)	<b>2.00</b>		0.20		0.92		0.88	
Mass Flow (g/min)	9.66		0.60		3.77		5.29	
	Flow rate (gmol/hr)	percents (mol%)	Flow rate (gmol/hr)	percents (mol%)	Flow rate (gmol/hr)	percents (mol%)	Flow rate (gmol/hr)	percents (mol%)
H <sub>2</sub>	100.00	5.00	<b>99.98</b>	<b>49.99</b>	0.02	0.00	0.00	0.00
HE	100.00	5.00	<b>100.00</b>	<b>50.00</b>	0.00	0.00	0.00	0.00
HD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D <sub>2</sub>	400.00	20.00	0.02	0.01	876.58	94.92	0.00	0.00
<u>DT</u>	<b>1,000.00</b>	<b>50.00</b>	0.00	0.00	46.79	5.07	0.04	0.00
T <sub>2</sub>	<b>400.00</b>	<b>20.00</b>	0.00	0.00	0.11	0.01	<b>876.48</b>	<b>100.00</b>

# 7. ITER ISS 공정 시뮬레이션 Case 3



Heat Exchanger ID	E2	E4	C1-cond.	C2-cond.	C3-cond.
Heat Exchanger Name	Cooler 1	Cooler 2	Condenser of C1 Column	Condenser of C2 Column	Condenser of C3 Column
Inlet Temperature (K)	298.1	298.1	23.89	24.01	23.33
Outlet Temperature (K)	20.0	20.0	21.64	24.00	24.31
Heat duty (kW)	<b>-0.8173</b>	<b>-0.0542</b>	<b>-0.2261</b>	<b>-1.1751</b>	<b>-4.9608</b>
Total heat duties (kW)	<b>-7.2335 (-7,233.5 Watt)</b>				

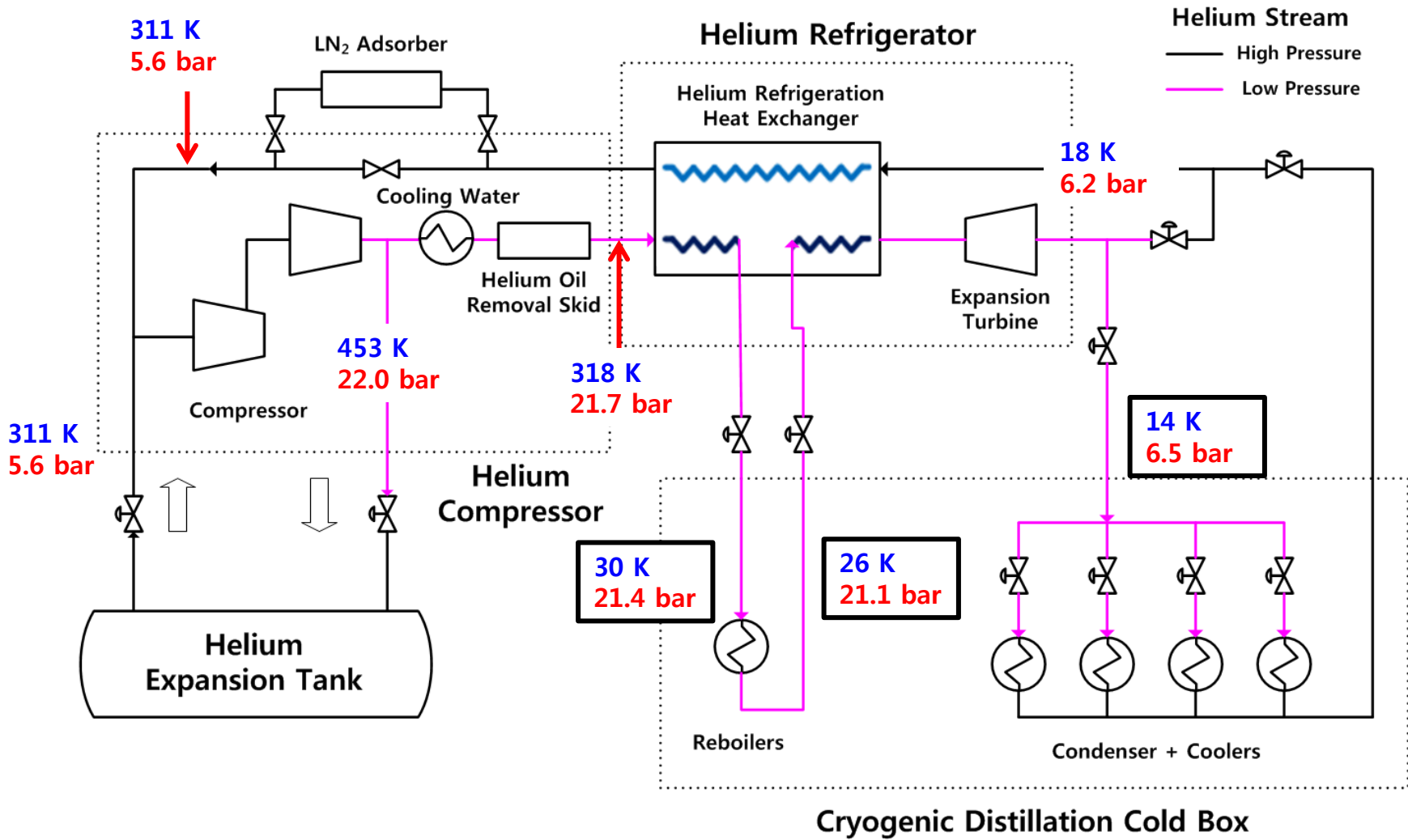
# 7. ITER ISS 공정 시뮬레이션 Case 3



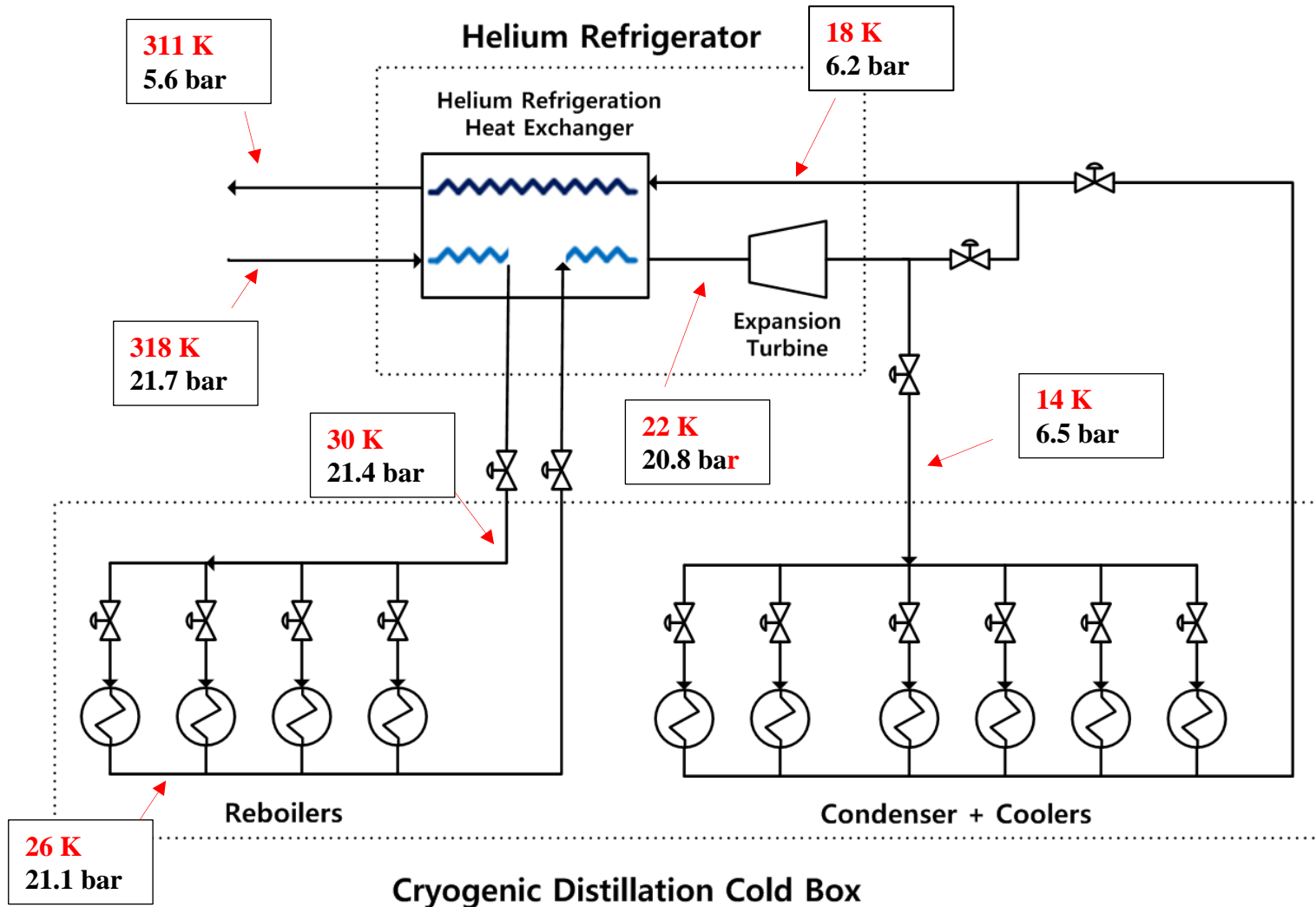
Heat Exchanger ID	C1-reb. Reboiler	C2-reb. Reboiler	C3-reb. Reboiler
Heat Exchanger Name	of C1 Column	of C2 Column	of C3 Column
Inlet Temperature (K)	25.23	24.80	24.96
Outlet Temperature (K)	25.24	24.81	24.96
Heat duty (kW)	<b>0.1807</b>	<b>1.1785</b>	<b>1.5275</b>
Total heat duties (kW)	<b>2.8867 (2,886.7 Watt)</b>		



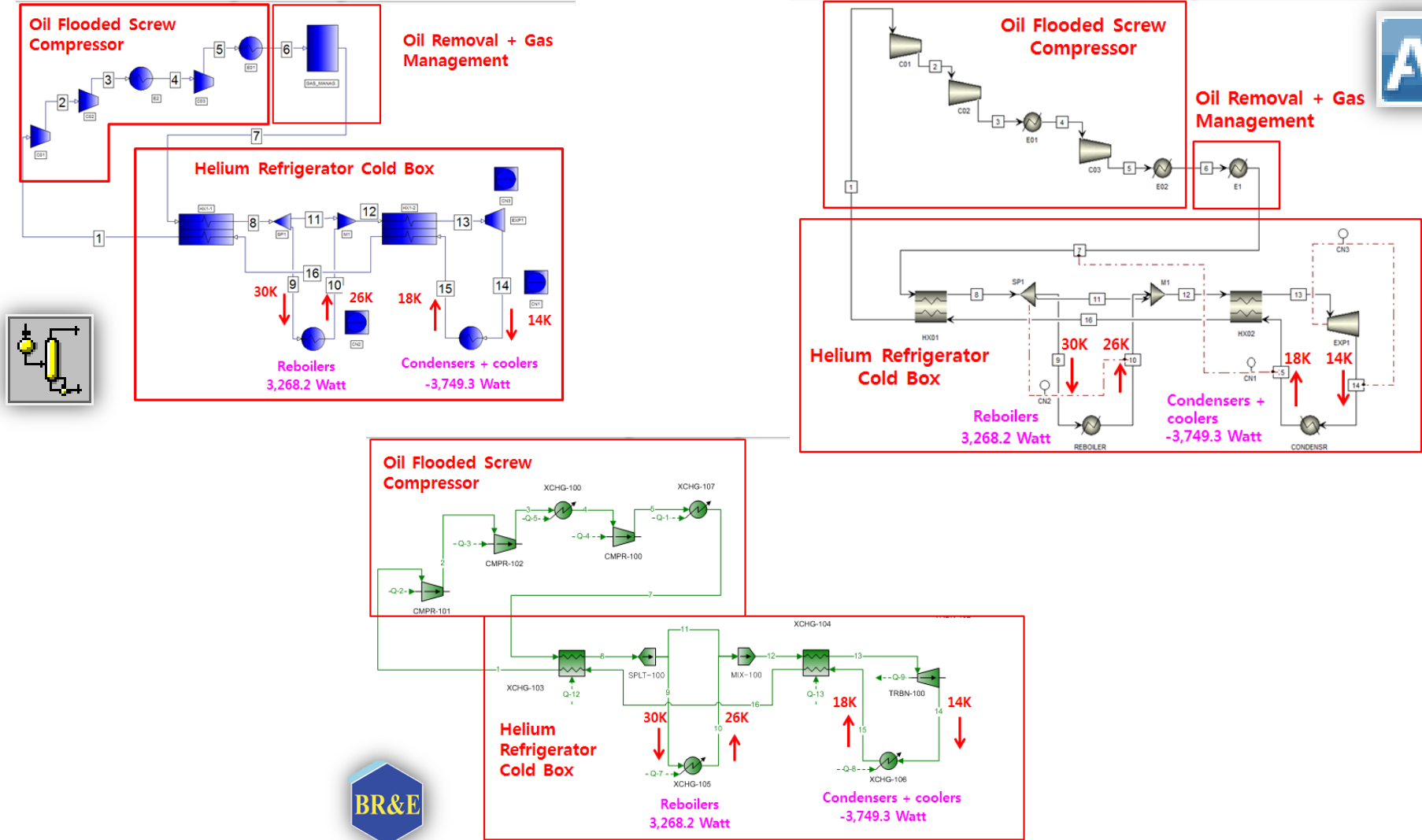
# 7. ITER ISS 공정 시뮬레이션 Case 3



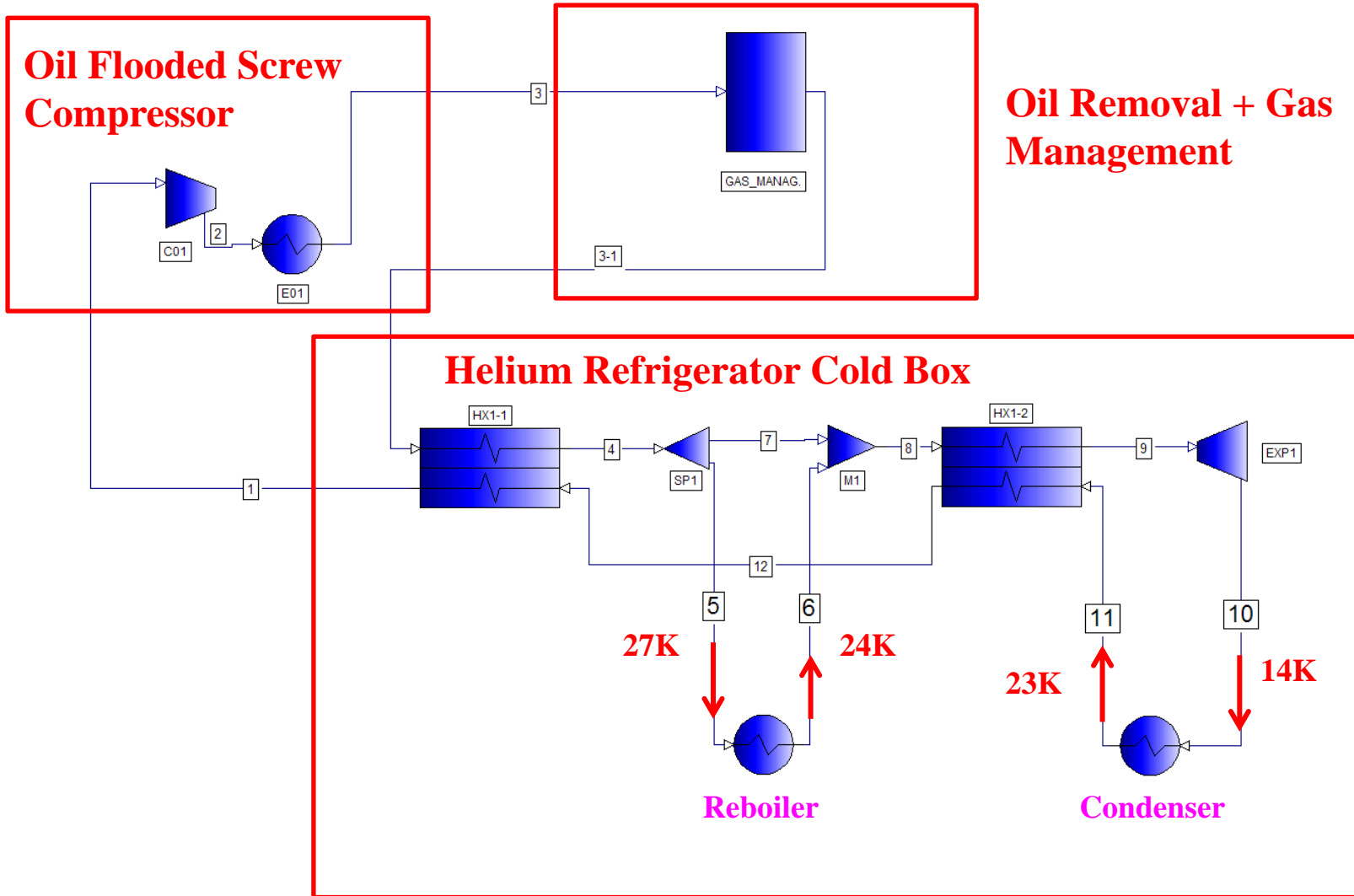
# 7. ITER ISS 공정 시뮬레이션 Case 3



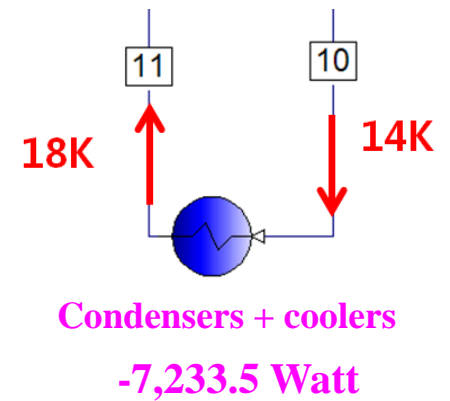
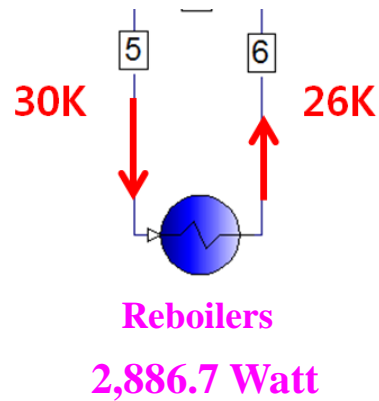
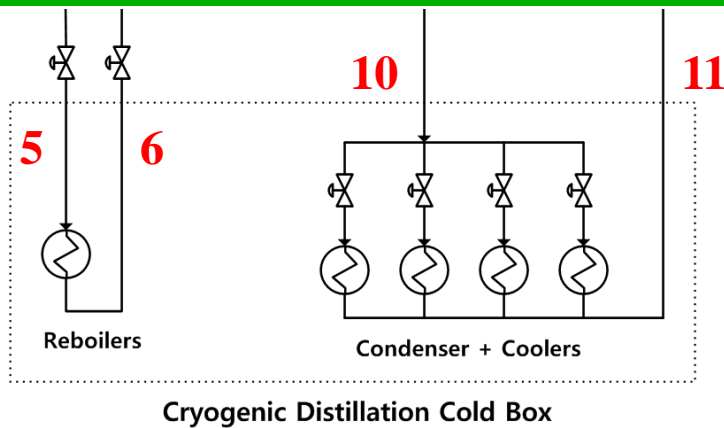
# 3. 헬륨 냉동 사이클



# 3. 헬륨 냉동 사이클



# 7. ITER ISS 공정 시뮬레이션 Case 3



## Stream number

Stream name

Temperature (K)

Pressure (kPa)

Phase

Total molar rate (kmol/h)

Total mass rate (kg/h)

**Helium**

5

Reb. inlet

**30.00**

19.67

Vapor

118.38

473.84

(kg/hr) (%)

**473.84 100**

6

Reb. outlet

**26.00**

19.37

Vapor

118.38

473.84

(kg/hr) (%)

**473.84 100**

10

Cond. inlet

**14.00**

5.40

Vapor

287.17

1,149.43

(kg/hr) (%)

**1,149.43 100**

11

Cond. outlet

**18.00**

5.10

Vapor

287.17

1,149.43

(kg/hr) (%)

**1,149.43 100**

---

**감사합니다**