Comparison of Critical Flow Models' Evaluations for SBLOCA Tests

2016.05.13.

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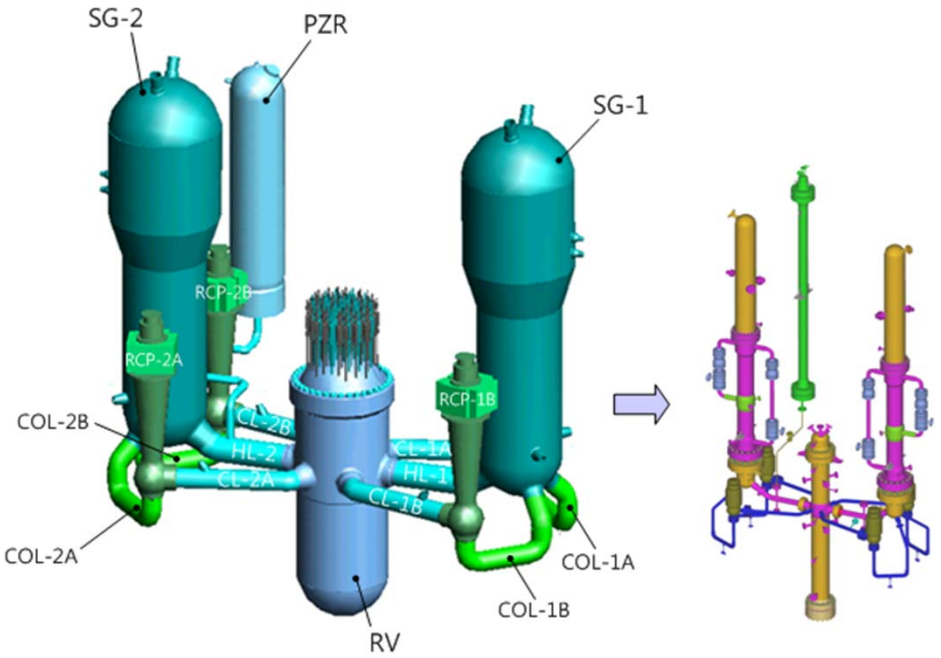
❑ APR1400 vs ATLAS Test Facility

○ Scaling of the ATLAS to APR1400

- 1/2 Height & Length, 1/12 Diameter, 1/288 Volume Scale
- 2-Hot Leg, 4-Cold Leg, Integrated Annular Downcomer, and DVI/CLI

○ Comparison of the RCS Arrangement

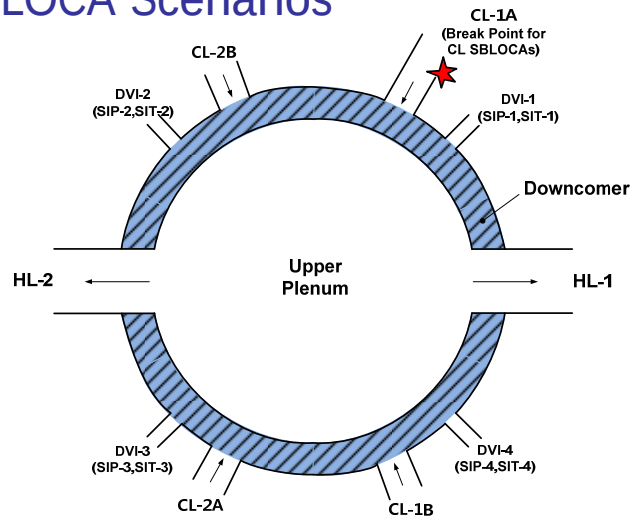


2. Test Conditions and MARS Model

❑ Arrangements for Main Loops and ECCS for CL SBLOCA Scenarios

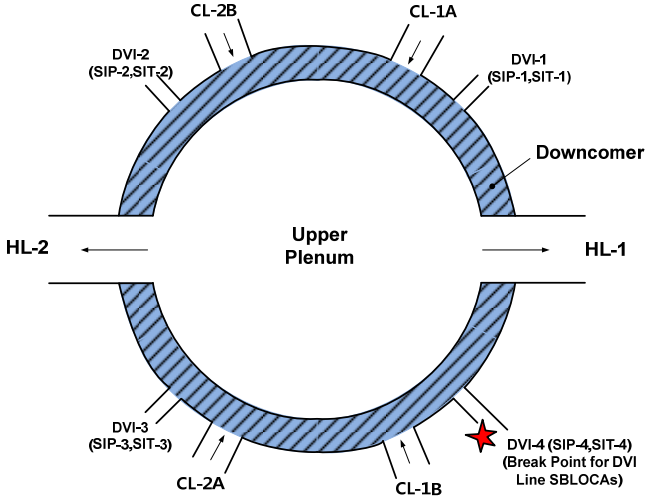
○ CL SBLOCA

- Break Location: CL-1A
- ECCS: 4 SITs and 2 HPSIPs (SIP-1,3)



○ DVI Line SBLOCA

- Break Location: DVI-4
- ECCS: 3 SITs and 1 HPSIP (SIP-2)



2. Test Conditions and MARS Model

❑ CL and DVI SBLOCA Tests for MARS-KS Simulation

○ Summary of CL SBLOCA tests for APR1400

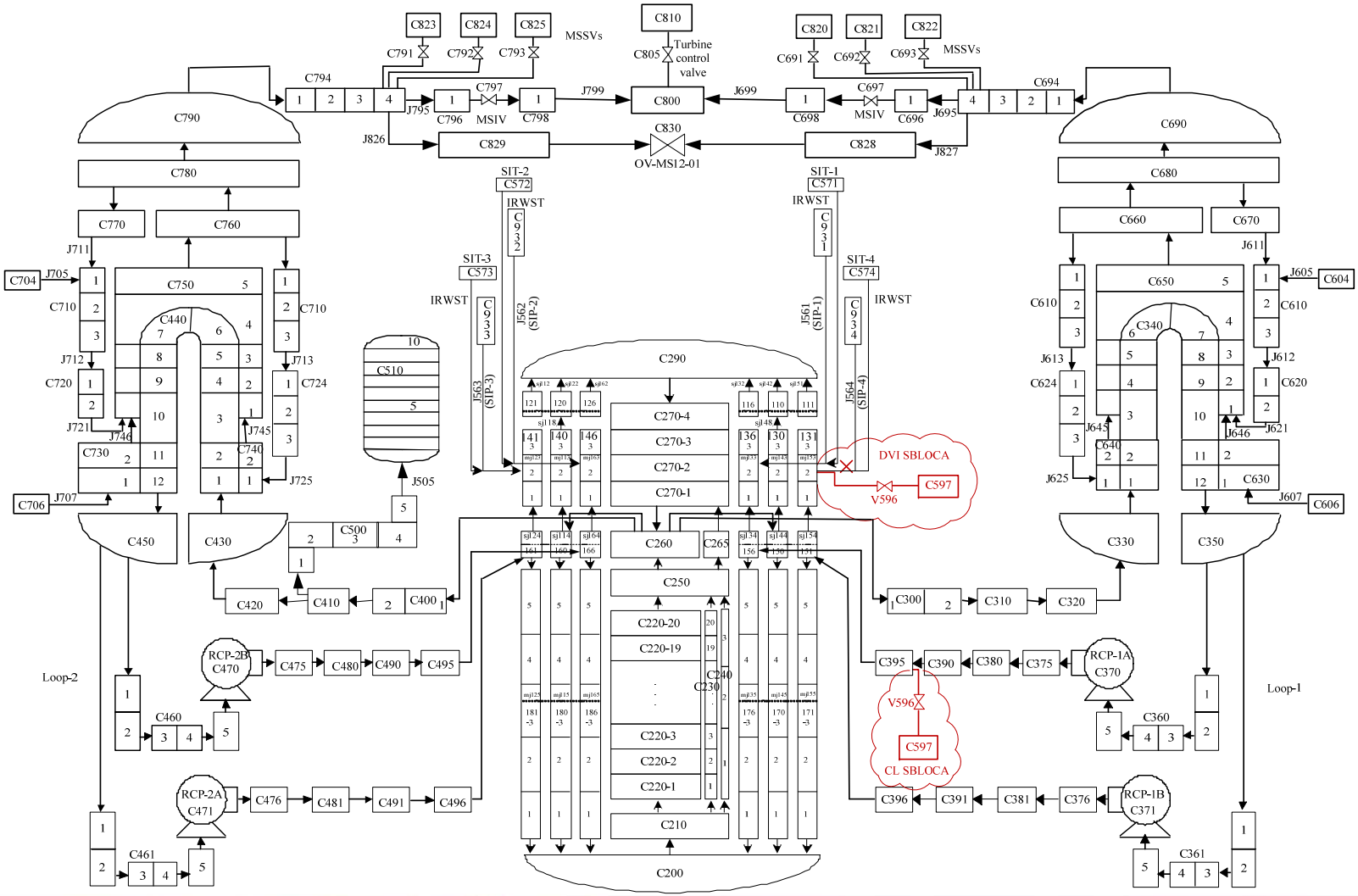
Test ID	Break Nozzle		Remark
	Size[a] (in.)	*D* (mm)	
SB-CL-07	2.0	3.56	
SB-CL-05	4.0	7.12	
SB-CL-09	6.0	10.68	DSP-02
SB-CL-04	8.5	15.13	

○ Summary DVI Line SBLOCA tests for APR1400

Test ID	Break Nozzle		Remark
	Size[a]	*D*[b]	
SB-DVI-06	5%	3.41mm (1.9 in.)	
SB-DVI-05	25%	7.63mm (4.3 in.)	
SB-DVI-09	50%	10.80mm (6.0 in.)	ISP-50
SB-DVI-08	100%	15.13mm (8.5 in.)	DSP-01

2. Test Conditions and MARS Model

- MARS Model for CL and DVI Line SBLOCA Tests



3. Results and Discussions

❑ Using the Previous Parametric Study for CCFL Options of FAP and COL

○ Results for DVI Line SBLOCA Tests Using HF Critical Flow Model

Test ID	Break Size	C_d	Applicable CCFL Options	
			FAP	COL
SB-DVI-06	5%	0.55	NA,Wa	Wa,Ku
SB-DVI-05	25%	0.79	NA,Wa	Wa,Ku
SB-DVI-09	50%	0.77	Wa	Wa,Ku
SB-DVI-08	100%	0.71	Wa	Wa,Ku

○ Results for CL SBLOCA Tests Using HF Critical Flow Model

Test ID	Break Size(in)	C_d	Applicable CCFL Options	
			FAP	COL
SB-CL-07	2.0	0.55	NA	Ku
SB-CL-05	4.0	**0.82**	NA	Ku
SB-CL-09	6.0	0.77	Wa	Ku
SB-CL-04	8.5	0.71	Wa	Ku

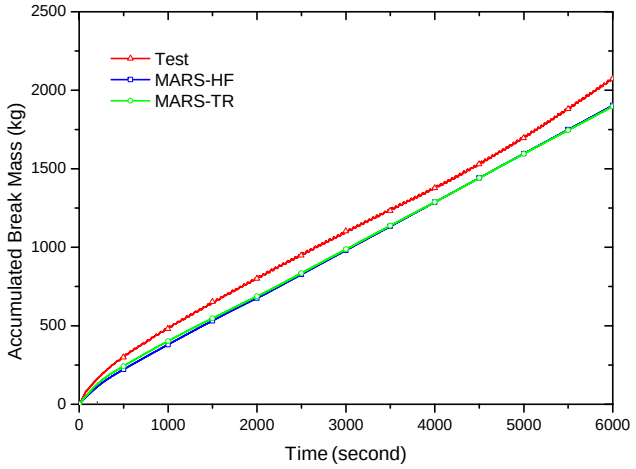
3. Results and Discussions

❑ Summary of Calculated *Cd* Data for Two Critical Flow Models for SBLOCA Tests

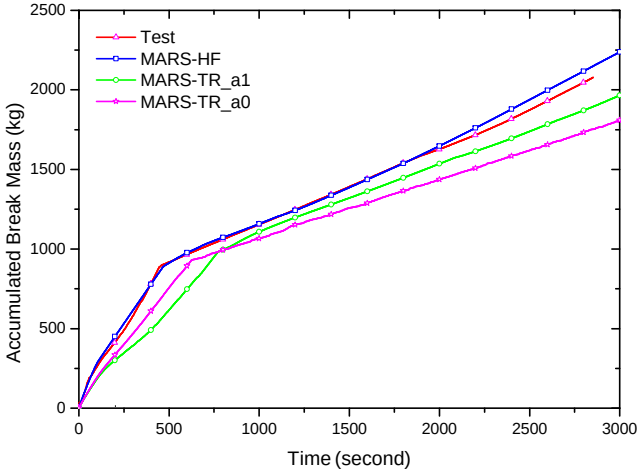
Break Location	Break Size	D(mm)	Henry-Fauske Model		Trapp-Ransom Model		
			Cd	*TNC*	Cd_{sub}	$Cd_{2\text{-}\phi}$	Cd_{sup}
CL-1A	2”	3.56	0.55	0.14	0.65	0.65	NA
	4”	7.12	0.82	Ditto	1.99	1.99	Ditto
	6”	10.68	0.77	Ditto	0.77	0.77	Ditto
	8.5”	15.13	0.71	Ditto	0.55	0.55	Ditto
DVI-4	5%(1.9”)	3.41	0.55	Ditto	0.50	0.50	Ditto
	25%(4.3”)	7.63	0.79	Ditto	0.79	0.79	Ditto
	50%(6.0”)	10.8	0.77	Ditto	0.77	0.77	Ditto
	100%(8.5”)	15.13	0.71	Ditto	0.71	0.71	Ditto

3. Results and Discussions

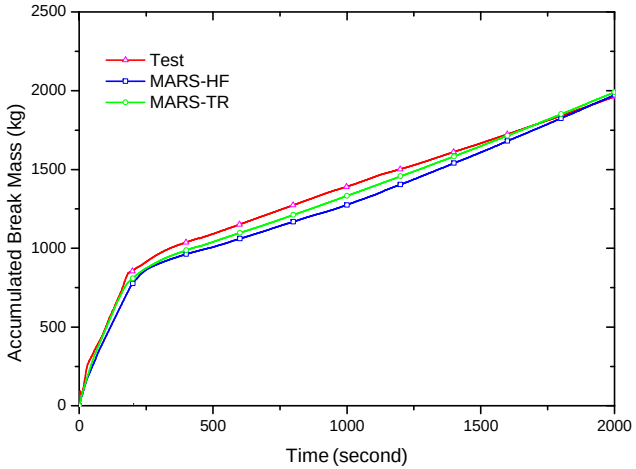
❑ Comparison of Accumulated Break Mass between Two Models (CL Breaks)



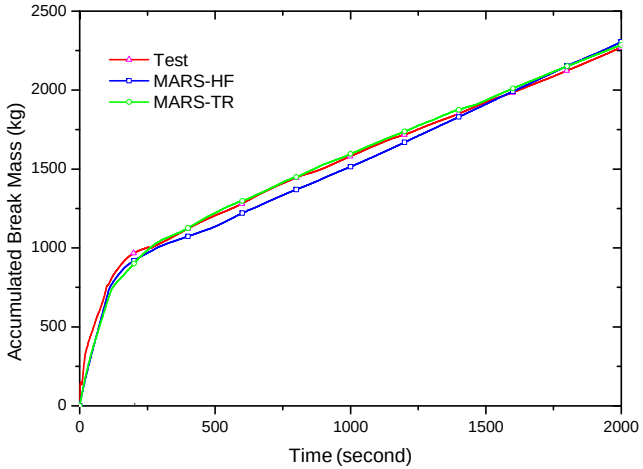
(a) 2" Break



(b) 4" Break



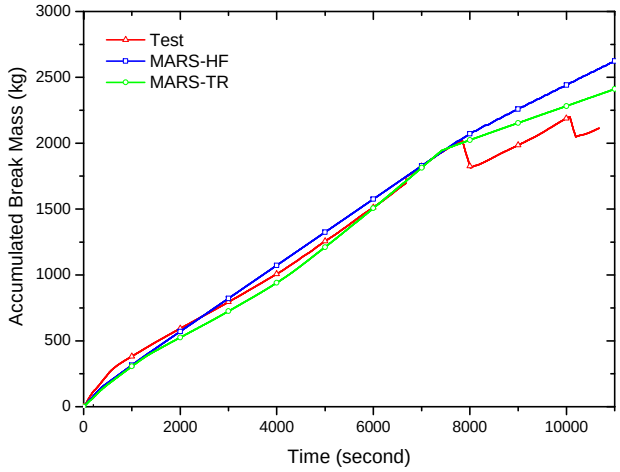
(c) 6" Break



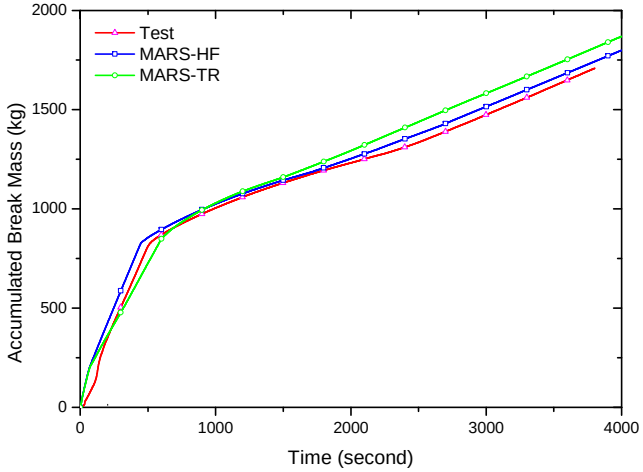
(d) 8.5" Break

3. Results and Discussions

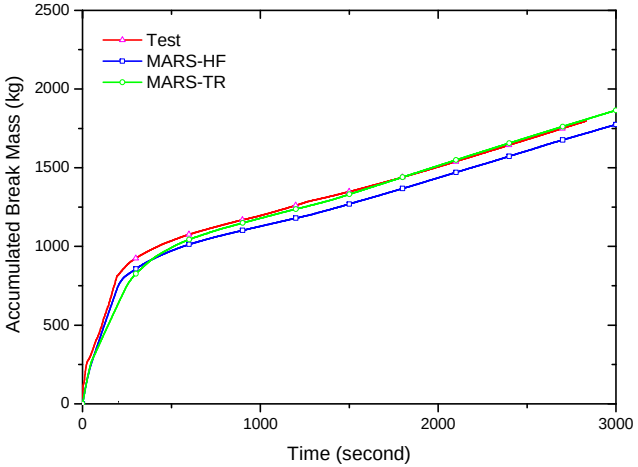
❑ Comparison of Accumulated Break Mass between Two Models (DVI Line Breaks)



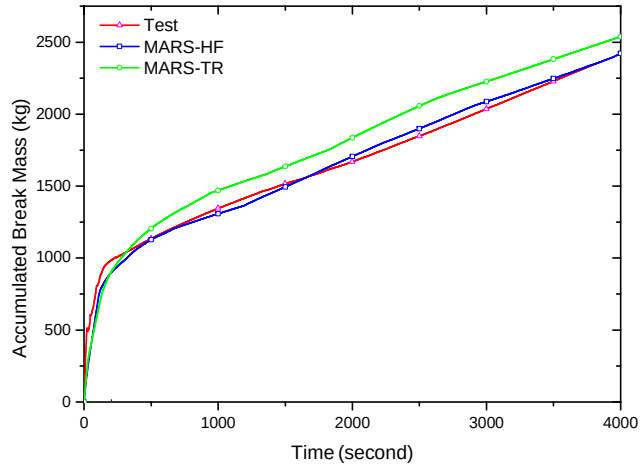
(a) 5% Break



(b) 25% Break



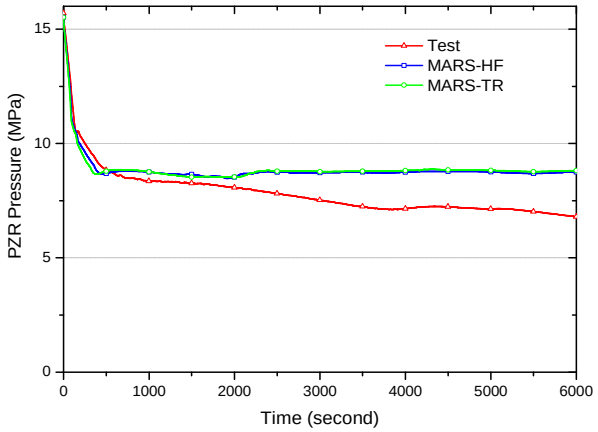
(c) 50% Break



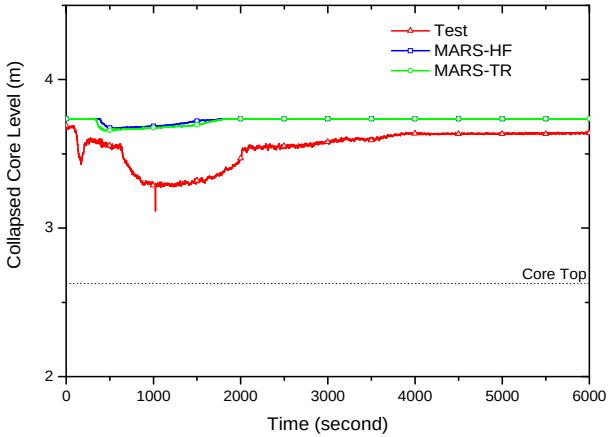
(d) 100% Break

3. Results and Discussions

❑ Comparison of PZR Pressure and Core Level for 2” and 4” CL Breaks

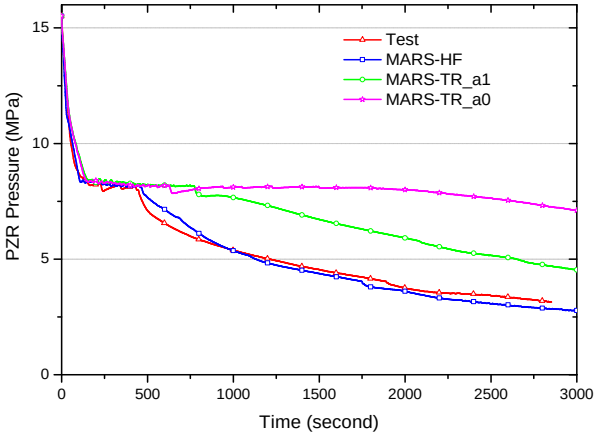


(a-1) PZR Pressure

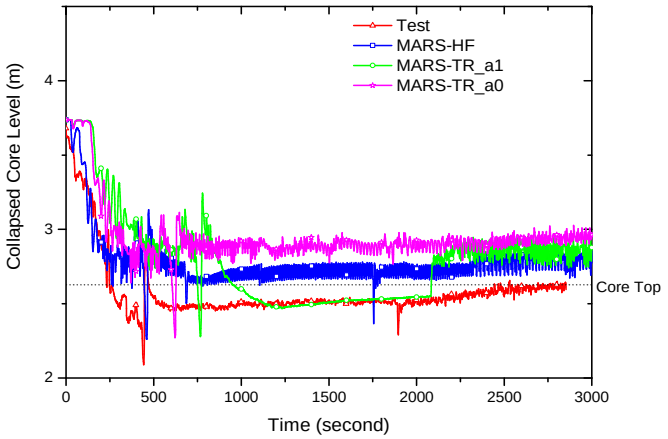


(a-2) Core Level

(a) 2" CL Break



(b-1) PZR Pressure

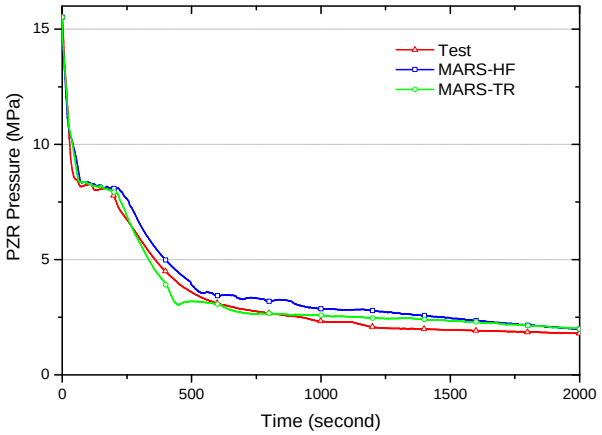


(b-2) Core Level

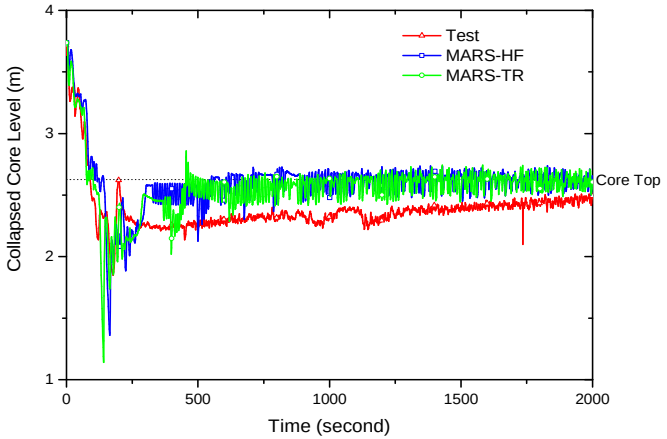
(b) 4" CL Break

3. Results and Discussions

❑ Comparison of PZR Pressure and Core Level for 6” and 8.5” CL Breaks

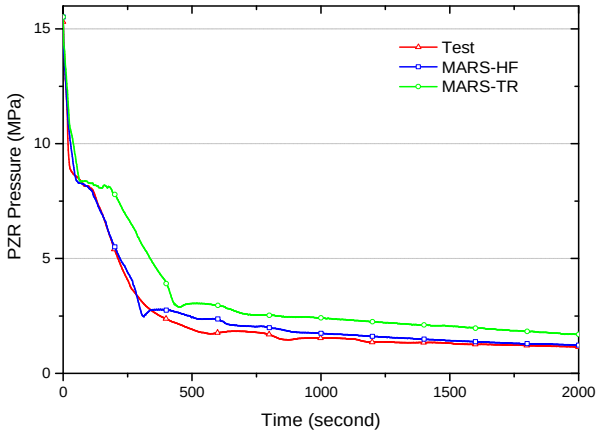


(a-1) PZR Pressure

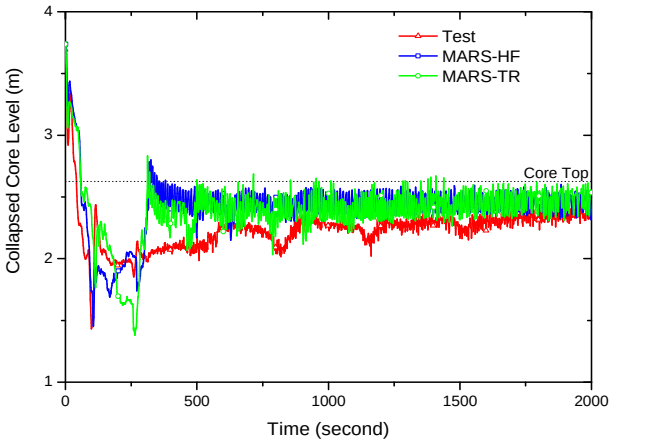


(a-2) Core Level

(a) 6" CL Break



(b-1) PZR Pressure

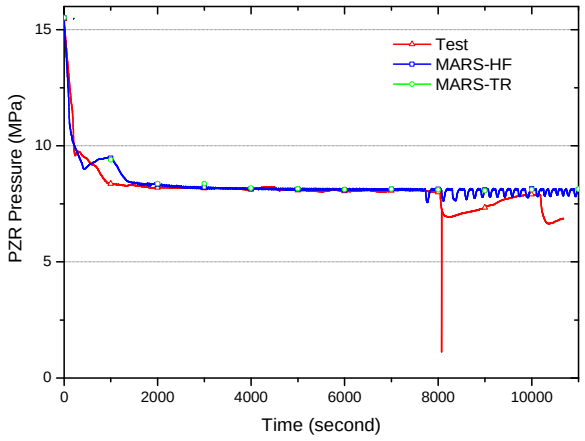


(b-2) Core Level

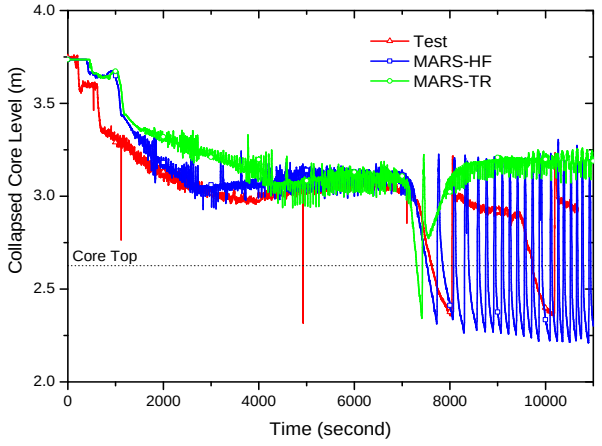
(b) 8.5" CL Break

3. Results and Discussions

❑ Comparison of PZR Pressure and Core Level for 5% and 25% DVI Line Breaks

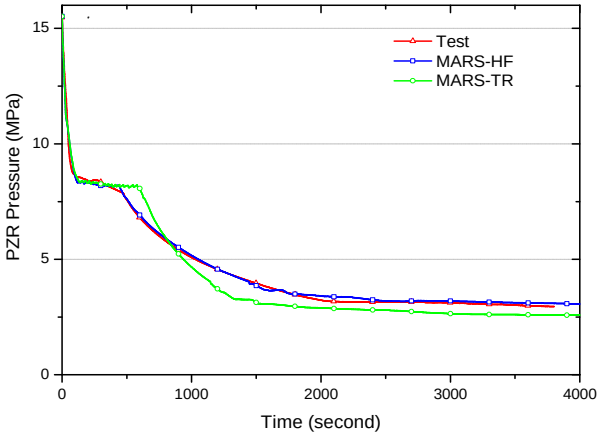


(a-1) PZR Pressure

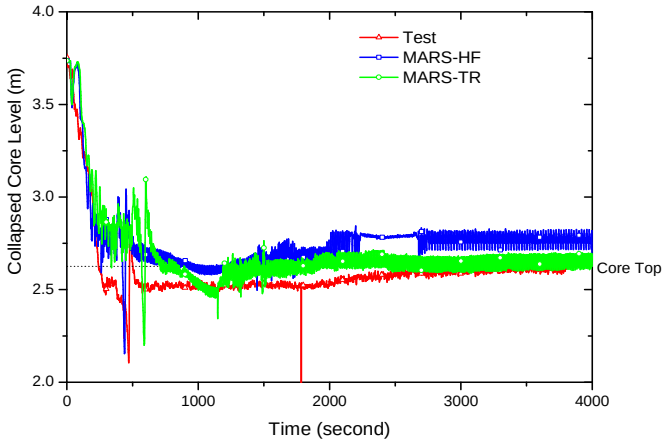


(a-2) Core Level

(a) 5% DVI Break



(b-1) PZR Pressure

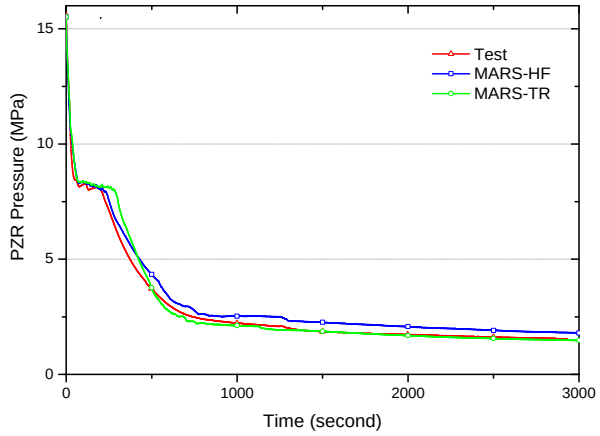


(b-2) Core Level

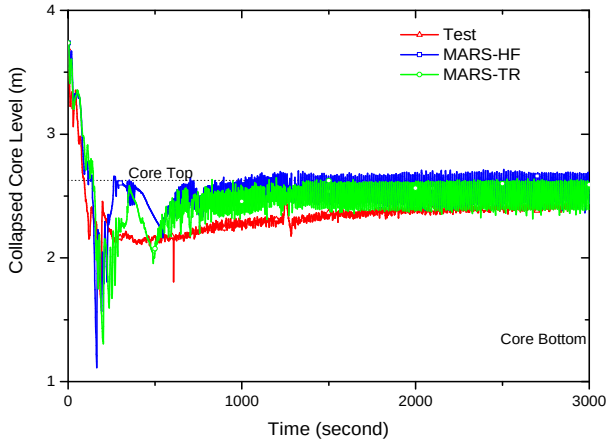
(b) 25% DVI Break

3. Results and Discussions

❑ Comparison of PZR Pressure and Core Level for 50% and 100% DVI Line Breaks

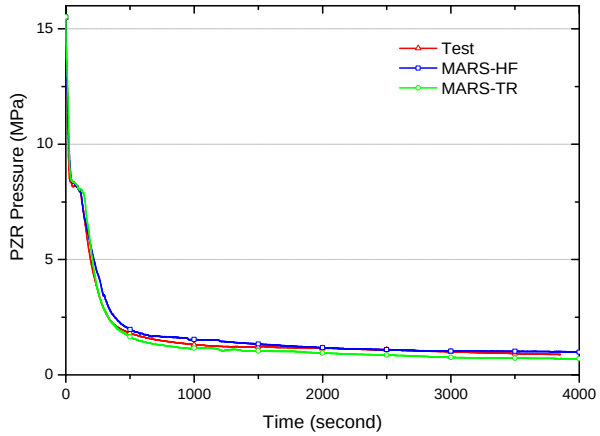


(a-1) PZR Pressure

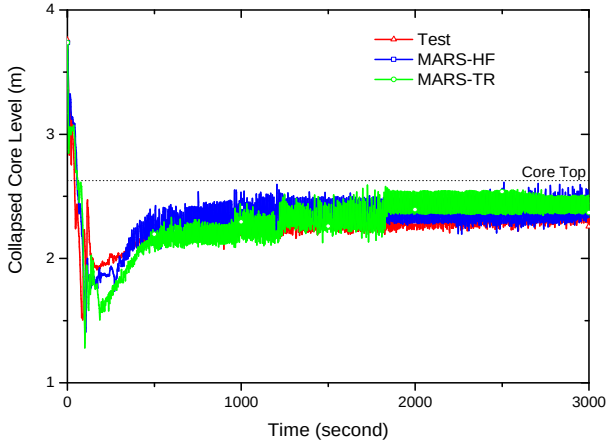


(a-2) Core Level

(a) 50% DVI Break



(b-1) PZR Pressure



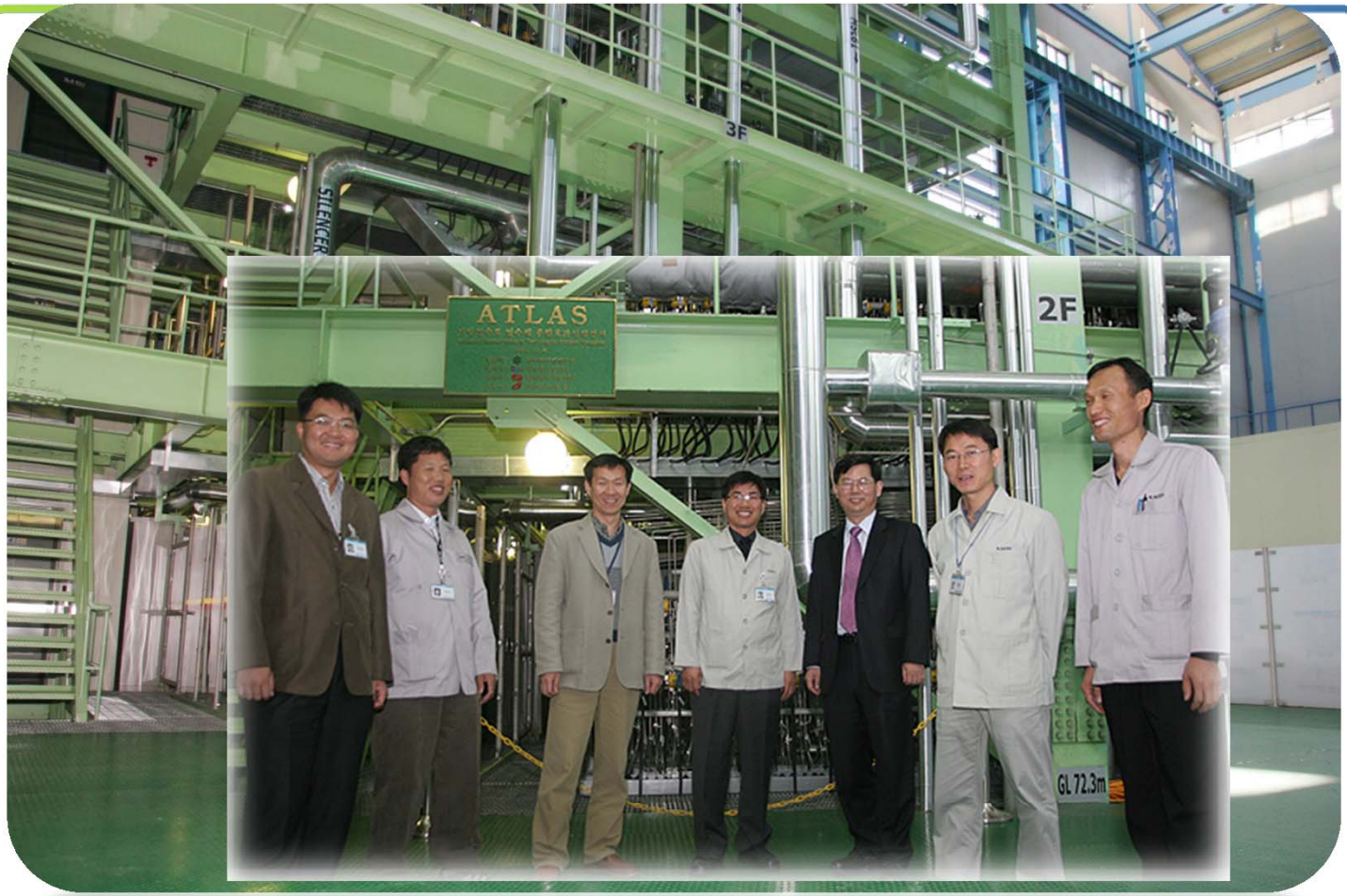
(b-2) Core Level

(b) 100% DVI Break

4. Conclusion

❑ Comparison of Critical Flow Models for CL and DVI Line SBLOCA Tests

- ○ Comparison of Accumulated Break Mass for Two Critical Models
  - ▪ Similar Results for 2”, 6”, and 8.5” CL Breaks; 5%, 25%, 50%, and 100% DVI Line Breaks
  - ▪ 4” CL Break: Good Result Using HF Model; No Reasonable Result Using TR Model
- ○ Comparison of PZR Pressure and Collapsed Core Water Level for Two Critical Models
  - ▪ Similar Results for 2”, 6”, and 8.5” CL Breaks; 50% and 100% DVI Line Breaks
  - ▪ 4” CL Break: Good Result Using HF Model; No Reasonable Result Using TR Model
  - ▪ 5% DVI Line Break: More Reasonable Results Using TR Model than HF Model
  - ▪ 25% DVI Line Break: More Reasonable Results Using HF Model than TR Model



감사합니다~ ^^*