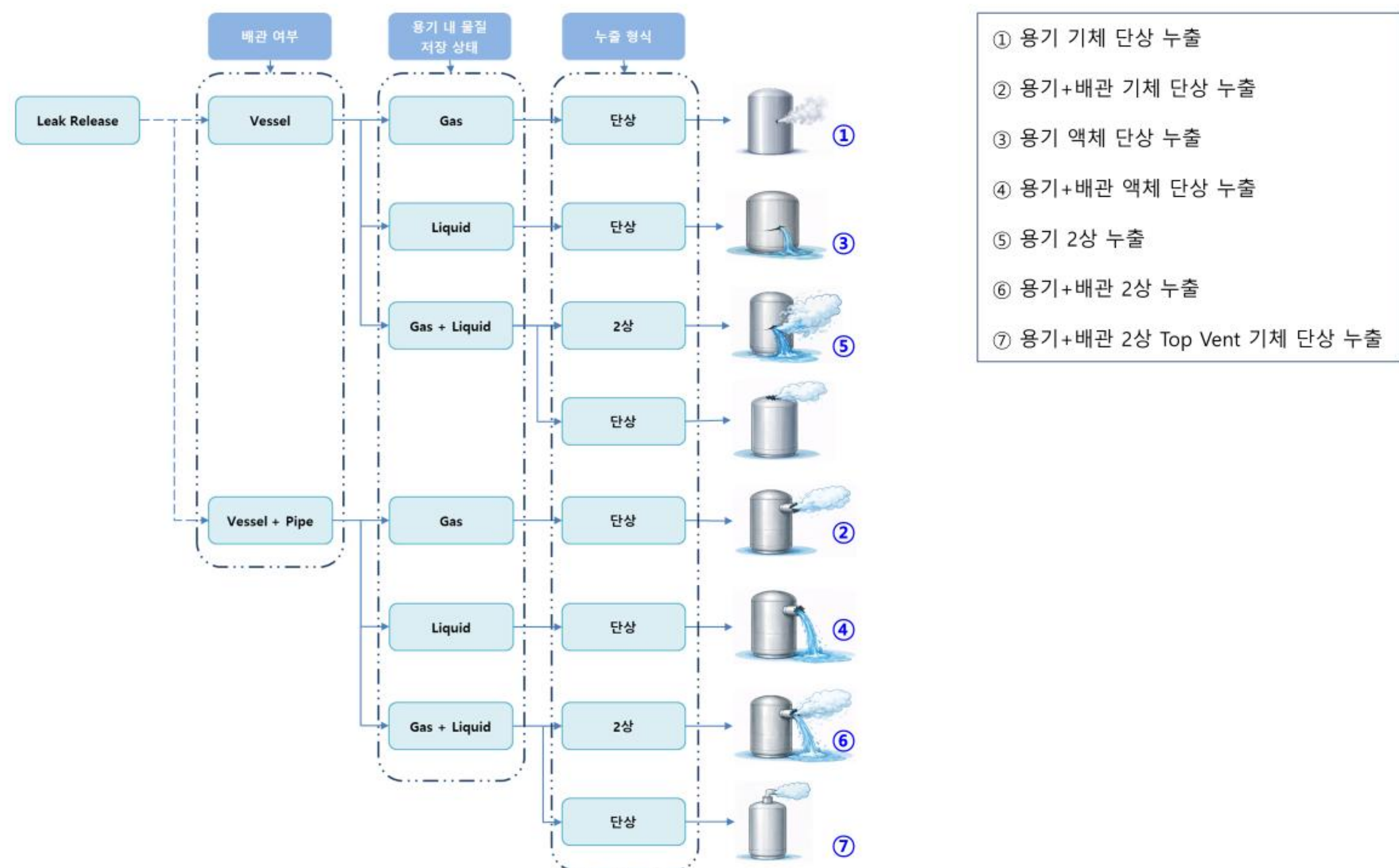


0. 누출 형식 분류(기존)

누출률 산정 모델 검토



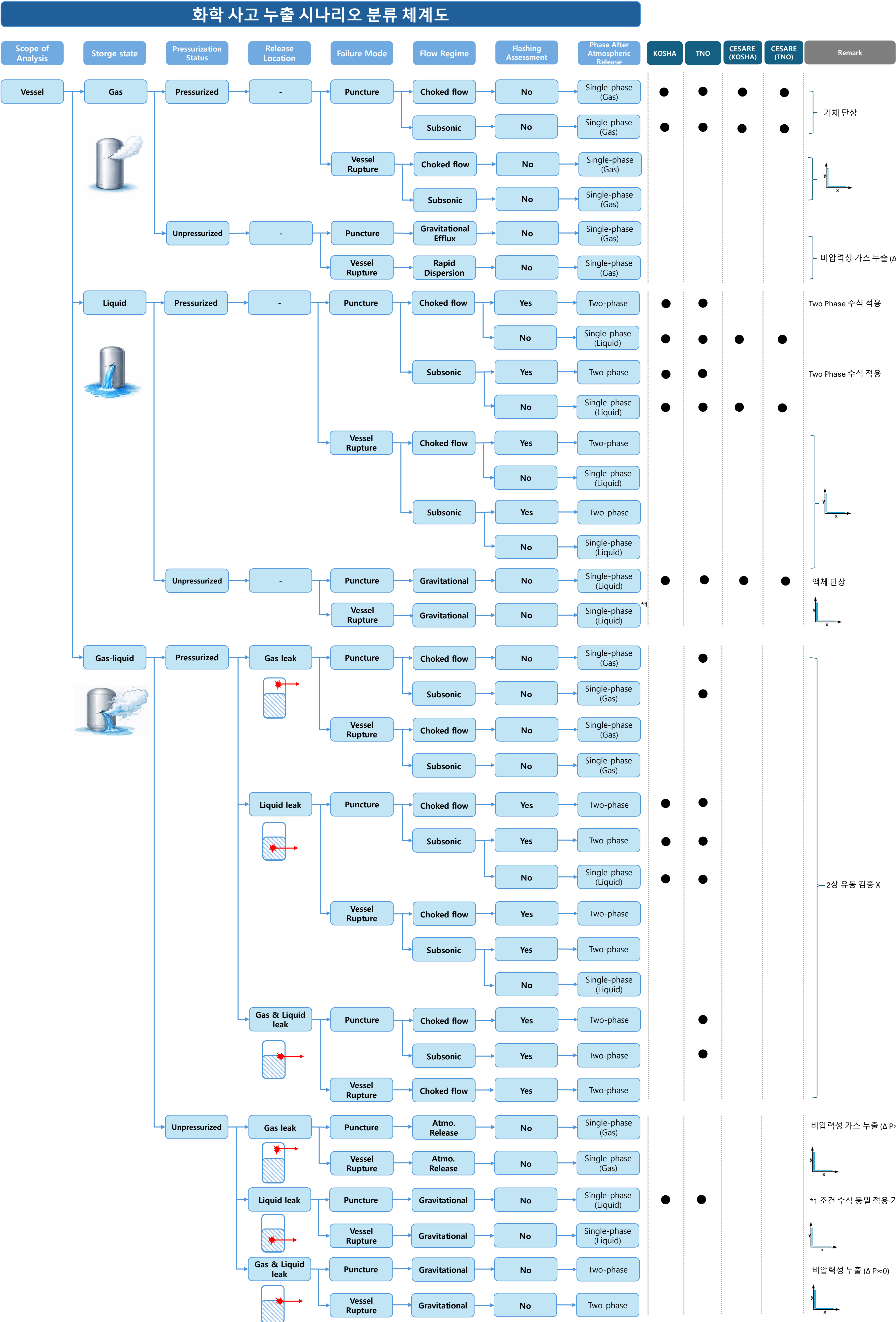
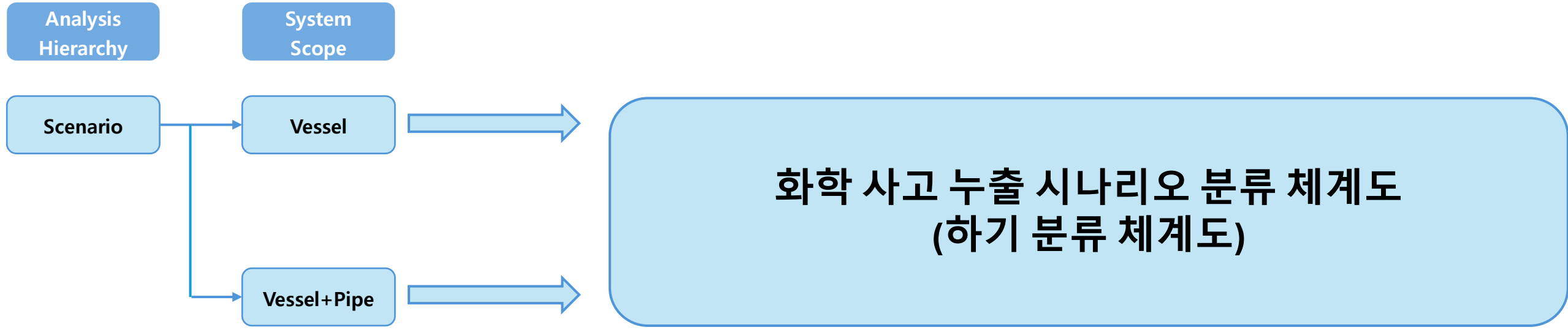
ELSOLTEC, Computational Solution in Complex Physics

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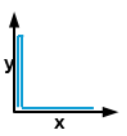
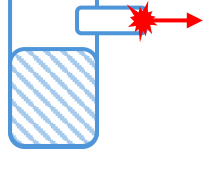
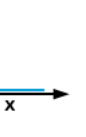
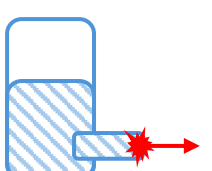
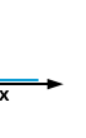
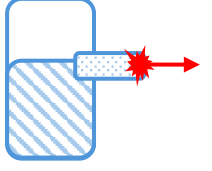
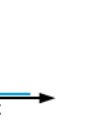
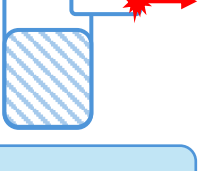
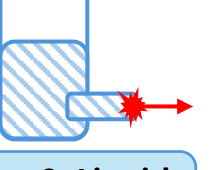
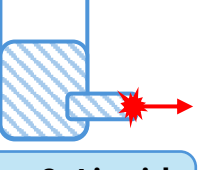
구분	Vessel (용기)	Pipe (배관)
Orifice (공)	Puncture	Leak
Rupture (파열)	Vessel Rupture	Full Bore Rupture

설명

- Vessel Orifice:** 용기 벽면의 구멍(구멍, 균열 등)을 통한 누출.
용기 내부 압력에 의해 유속이 결정.
- Vessel Rupture:** 용기 자체가 완전히 붕괴(대규모 균열)
용기 내 전체 내용물이 짧은 시간 내에 급격히 방출.
- Pipe Orifice:** 배관 측면의 홀이나 미세 균열되는 현상.
배관 내부의 압력과 유속이 누출을 지배.
- Pipe Rupture (Full Bore):** 배관이 완전히 절단(Guillotine)되는 경우(직경이 누출 면적).
배관 양쪽 끝(Upstream, Downstream)에서 내용물이 누출.



화학 사고 누출 시나리오 분류 체계도

Scope of Analysis	Storge state	Pressurization Status	Release Location	Failure Mode	Flow Regime	Flashing Assessment	Phase After Atmospheric Release	KOSHA	TNO	CESARE (KOSHA)	CESARE (TNO)	Remark				
Vessel+Pipe	Gas 	Pressurized	-	Leak	Choked flow	No	Single-phase (Gas)	●	●	●	●	기체 단상				
					Subsonic	No	Single-phase (Gas)	●	●	●	●					
				Full Bore Rupture	Choked flow	No	Single-phase (Gas)									
					Subsonic	No	Single-phase (Gas)									
			Unpressurized	-	Leak	Gravitational Efflux	No	Single-phase (Gas)					비압력성 가스 누출 (ΔP≈0)			
						Rapid Dispersion	No	Single-phase (Gas)								
				Full Bore Rupture	Choked flow	No	Single-phase (Gas)									
					Subsonic	No	Single-phase (Gas)									
		Liquid 	Pressurized	-	Leak	Choked flow	Yes	Two-phase	●	●			Two Phase 수식 적용			
							No	Single-phase (Liquid)	●	●	●	●	Two Phase 수식 적용			
						Subsonic	Yes	Two-phase	●	●	●	●				
						No	Single-phase (Liquid)	●	●	●	●					
					Full Bore Rupture	Choked flow	Yes	Two-phase								
							No	Single-phase (Liquid)								
				Subsonic		Yes	Two-phase									
					No	Single-phase (Liquid)										
	Unpressurized			-	Leak	Gravitational	No	Single-phase (Liquid)	●	●	●	●	액체 단상			
							Gravitational	No	Single-phase (Liquid)							
						Full Bore Rupture	Gravitational	No	Single-phase (Liquid)							
				Gas-liquid 	Pressurized	Gas leak 	Leak	Choked flow	No	Single-phase (Gas)	▲	●	▲	●	기체 단상 TopVent - KOSHA는 누출 식만 있음	
			Subsonic					No	Single-phase (Gas)	▲	●	▲	●			
			Full Bore Rupture				Choked flow	No	Single-phase (Gas)							
	Subsonic						No	Single-phase (Gas)								
	Liquid leak 		Leak				Choked flow	Yes	Two-phase	▲	●	2상 유동 검증X				
							Subsonic	Yes	Two-phase	▲	●					
							No	Single-phase (Liquid)	●	●						
			Full Bore Rupture			Choked flow	Yes	Two-phase								
						Subsonic	Yes	Two-phase								
							No	Single-phase (Liquid)								
	Gas & Liquid leak 		Leak			Choked flow	Yes	Two-phase	●	●	KOSHA는 평형/비평형/포화 적용					
						Subsonic	Yes	Two-phase	●	●						
				Full Bore Rupture	Choked flow	Yes	Two-phase									
		Unpressurized	Gas leak 	Leak	Atmo. Release	No	Single-phase (Gas)							비압력성 가스 누출 (ΔP≈0)		
					Full Bore Rupture	Atmo. Release	No								Single-phase (Gas)	
				Liquid leak 	Leak	Gravitational	No	Single-phase (Liquid)	●	●			*1 조건 수식 동일 적용 가능			
	Full Bore Rupture					Gravitational	No	Single-phase (Liquid)								
	Gas & Liquid leak 			Leak	Gravitational	No	Two-phase					비압력성 누출 (ΔP≈0)				
					Full Bore Rupture	Gravitational	No						Two-phase			