

압력 변화에 따른 용접형 벨로우즈 외부에 가해지는 충격에 대한 유동 해석과 수명 예측

Analyzing flow and predicting life expectancy regarding exterior impact on welded metal bellows due to changes in pressure.

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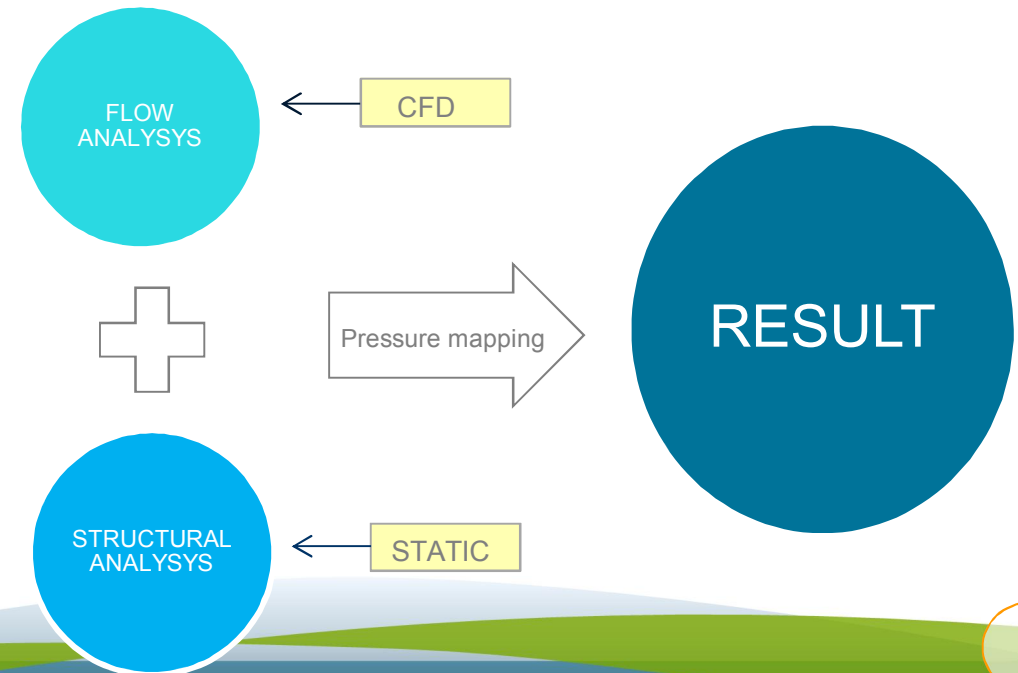
Description	Flow Analysis	Structural Analysis
Element type	FC3D4	3CD8R
Element Shape	Tetrahedral	Hexahedral
Total number of elements	214,656	21,384
Min. Element size	10mm	2mm
Solving time	Intel(R) Xeon® CPU E5 2*687W v4 @ 3.00GHz / RAM 256Gb / 8Core : 4.5 days	Intel(R) Core™ i-7-6700 CPU @ 3.40GHz / RAM 64Gb / 4Core : 9s

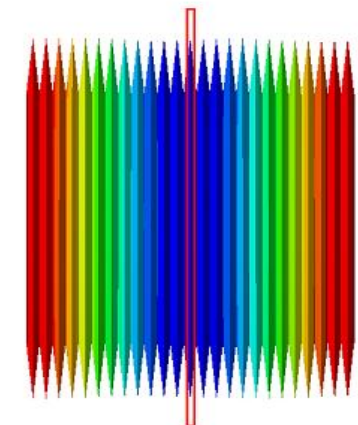
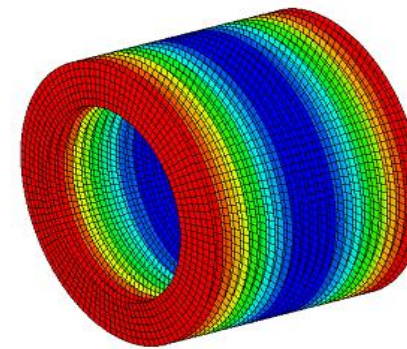
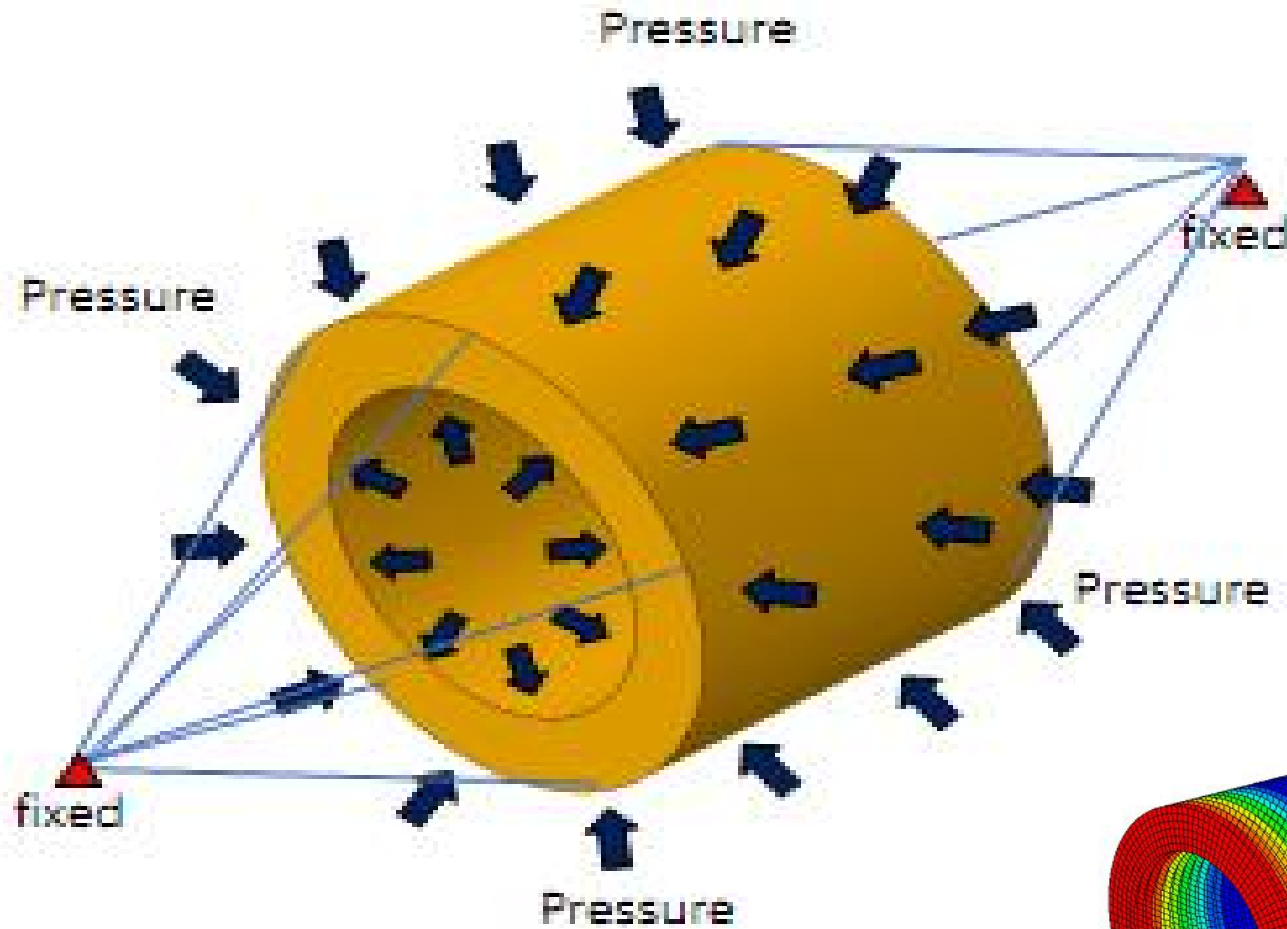


> EDGE BELLOWS TEST MODEL

2.Procedure & Material Property

MATERIAL PROPERTY		
AM350		
Young`s Modulus	Poison`s Ratio	Density
200000 Mpa	0.3	7.92e-9 ton/mm ³
Yield Stress	UTS	Elongation
480 Mpa	1035 Mpa	0.3
CDA		
Viscosity	Density	
1E-7 ton/mm*s	1.293e-12 ton/mm ³	

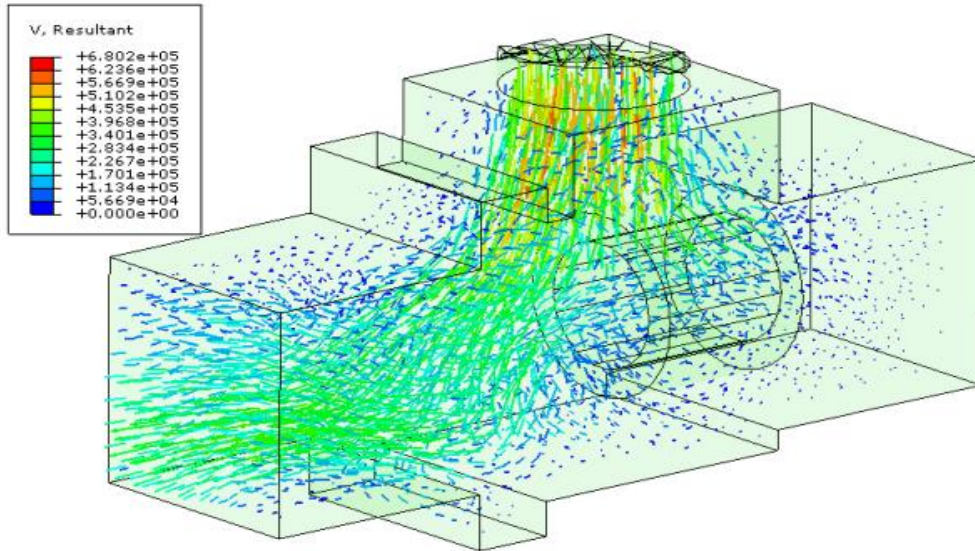




Maximum stress

Structural analysis

- Condition 1. Inlet 0.5 Mpa
- Condition 2. Outlet 0.0 Mpa
- Condition 3. Fixing both side of Bellows



∴ 노즐 부근에서 최대 속도가 발생하였고, Bellows 부근의 최대 속도는 680 m/s 로 측정 됨.

Maximum speed captured at the nozzle

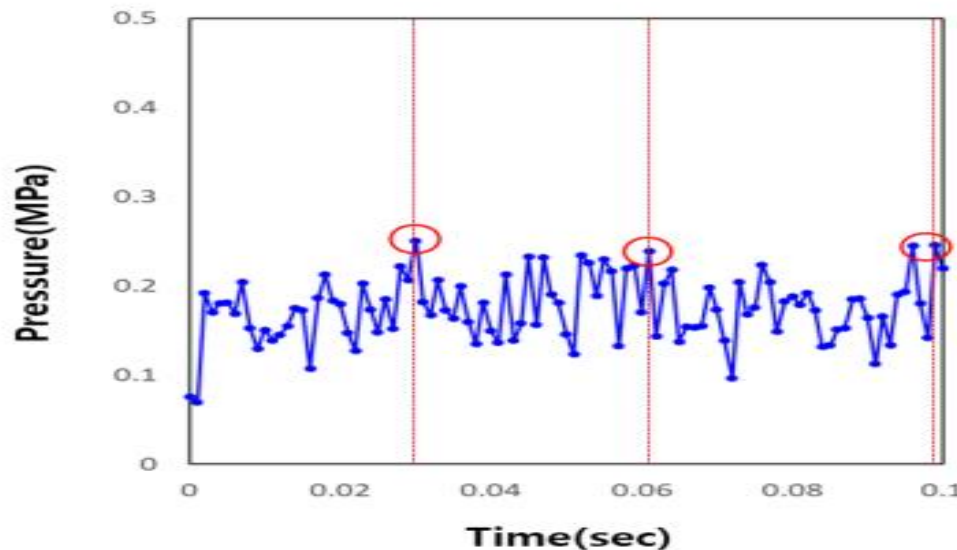
∴ Bellows 부근 공기의 속도 700 m/s 이하
 maximum 680m/s measured at the bellow

∴ 0.03, 0.06, 0.01 초에서 압력의 Peak 값 확인.
 Peak value of pressure at 0.03, 0.06, 0.01 sec.

∴ 압력이 가장 높게 걸리는 시간 때에서의 구조 해석 수행
 structural analysis is done at the time when the pressure is the highest

∴ 측정 위치는 유동 압력이 가장 높은 곳에 위치
 point of measurement is where the flow pressure is the highest

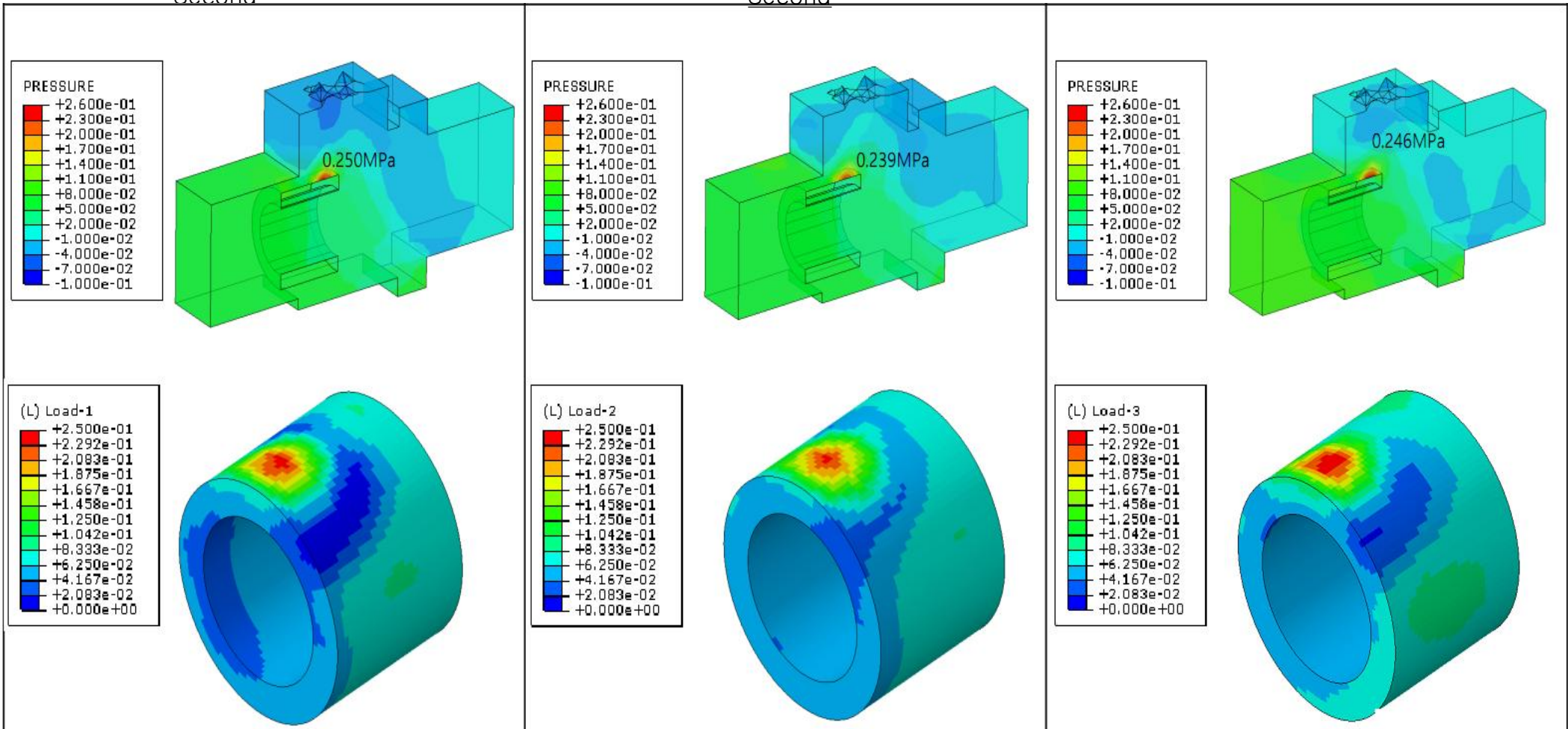
∴ 측정 위치에서의 압력 값에 약간의 Oscillation이 존재 하나,
 0.1 Mpa~0.25Mpa 구간 내에 존재 함.
 While oscillation exists at the measured point for value of pressure, this ranges from 0.1 Mpa to 0.25 Mpa.



0.03
Second

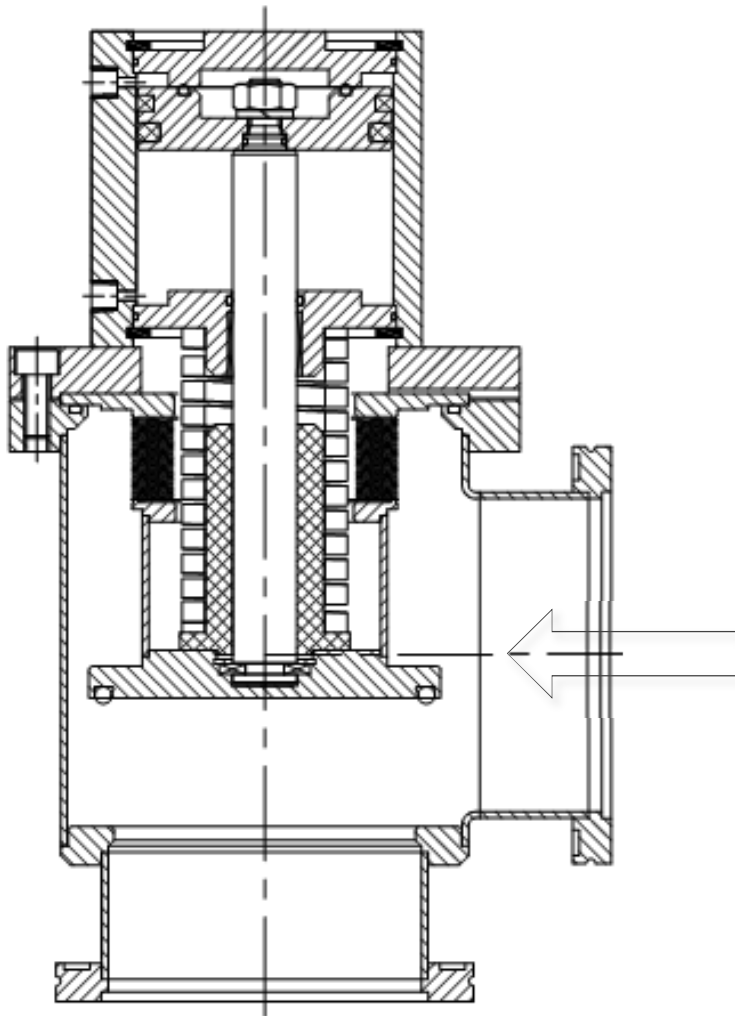
0.06
Second

0.10Second

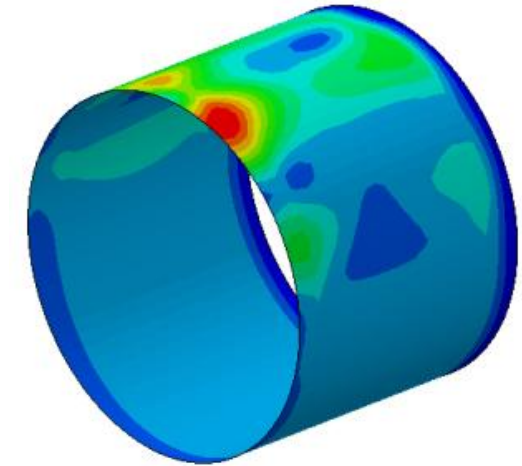
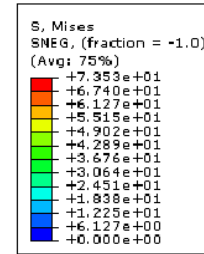


0.03, 0.06, 0.10 세 타임에서 모두 유사한 값을 가지며, Bellows에 압력을 맵핑한 결과 모두 유사한 분포를 가지고 있음.
 Similar values at three points in time, 0.03, 0.06, 0.10. Upon mapping pressure to bellows, all show similar distribution.

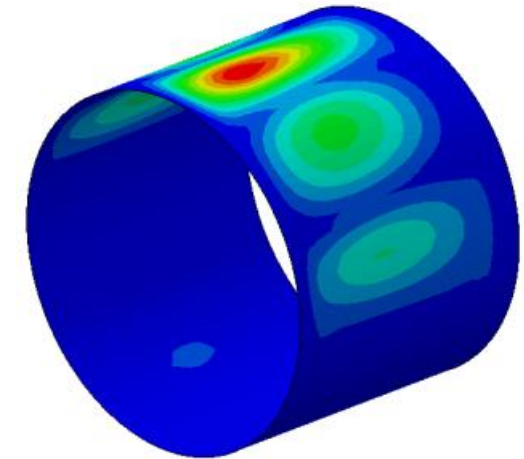
5.Conclusion



PRSSURE
0.5Mpa



> Displacement



> Stress

고 진공 앵글밸브의 BELLOWS 측면 가압 조건의 실험 및 데이터 산출 완료.

Testing and data for the pressure conditions of high vacuum angle valves' bellows complete

END.