Actuator-CAT 실습 고급

물용 솔레노이드 밸브 거동해석

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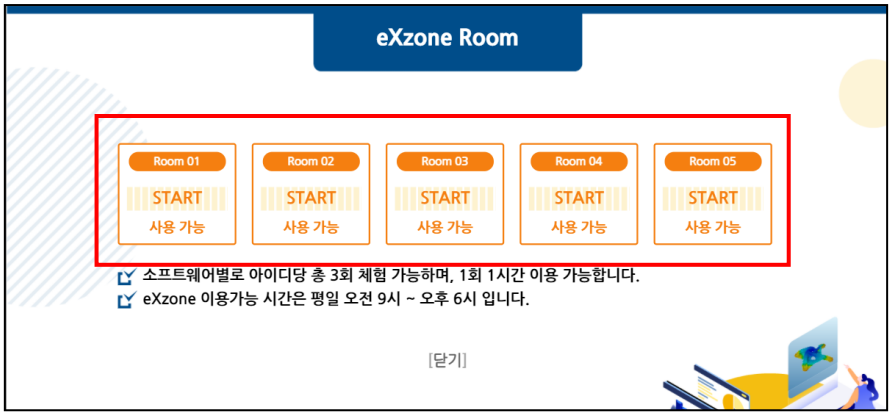
01 체험존 실행 및 예제 소개

Actuator-CAT 체험존 실행 방법

1. **eXzone Room 실행**
   - Room 버튼 클릭
   - 사용시간 : 평일 9시 ~ 18시
2. **Actuator-CAT 2D 실행**
   - Actuator-CAT 2D-Starter 버튼 클릭
   (실행 : 1분 소요됨)
3. **Actuator-CAT 확인**

1



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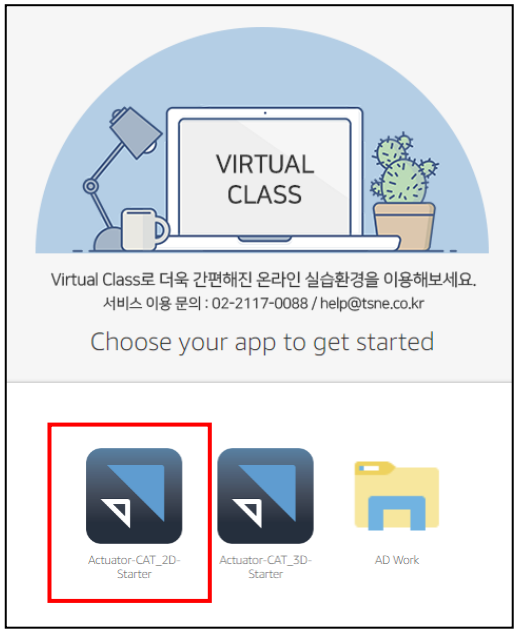

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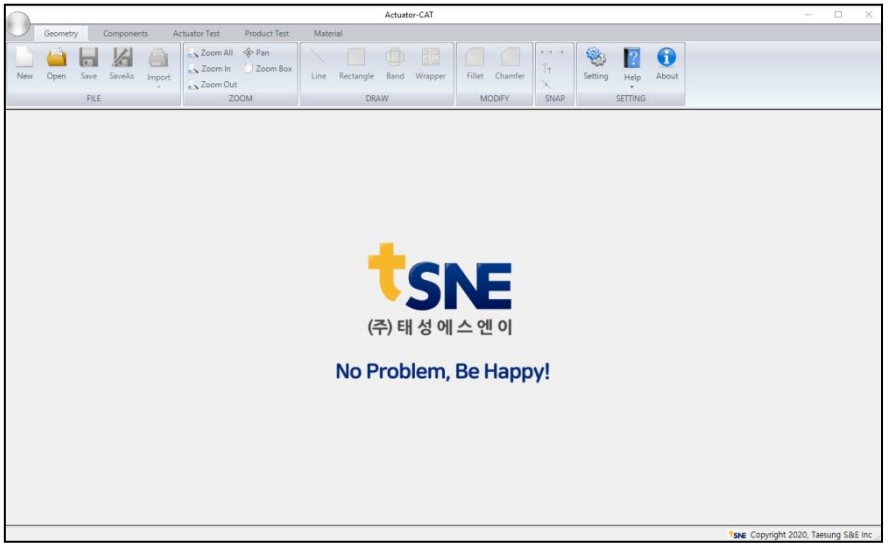
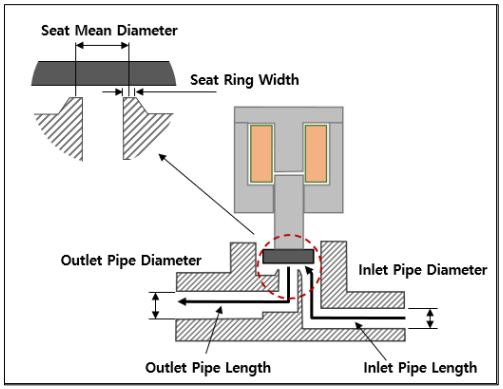
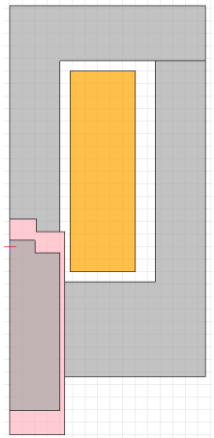


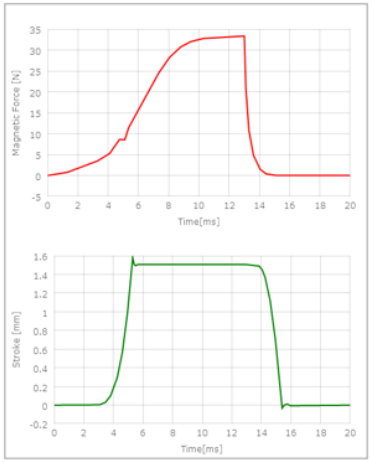
예제 모델 설명

- **예제 아이템**
  - Solenoid Valve : 물용 솔레노이드 밸브
- **해석 목적**
  - 성능검증 : 물용 솔레노이드 밸브 거동해석

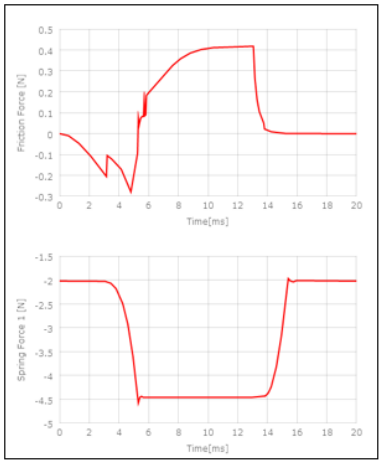




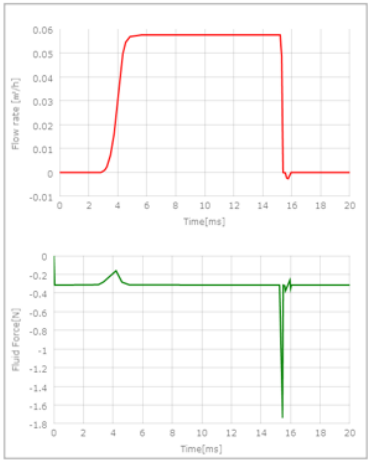
1. 변위, 자기력



2. 마찰력, 스프링력



3. 유량, 유체력

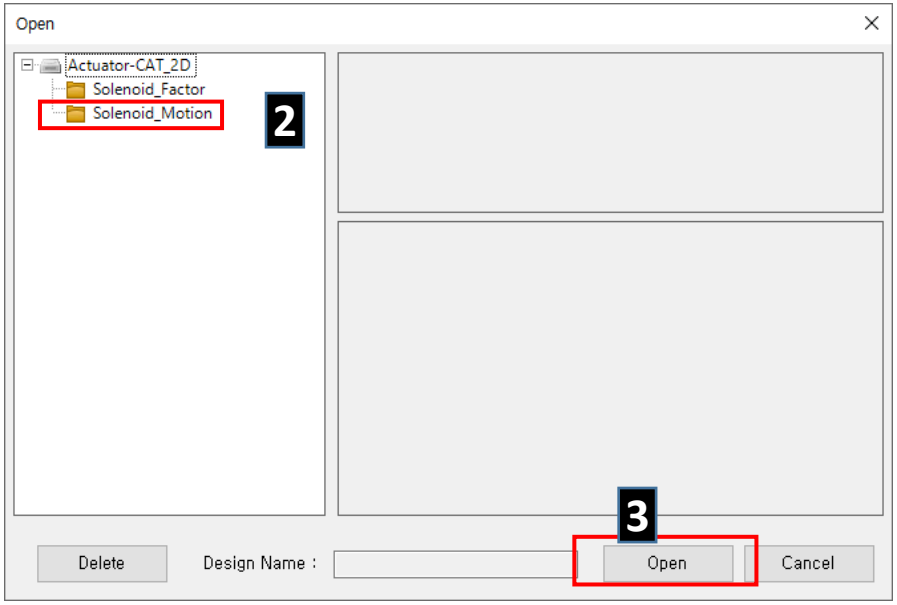


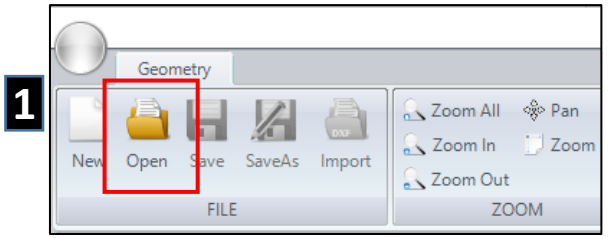
02 솔레노이드 밸브 거동 해석

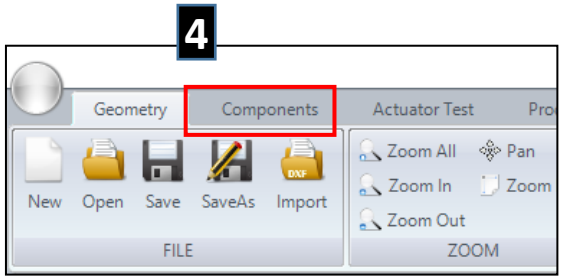
- 단계 설명 : 밸브 성능검증 시스템 해석
- 작업 내용 : 시스템 모델링, 밸브 거동 해석

디자인 열기

1. **Toolbar > Open 버튼 클릭**
2. **디자인 선택**
   - **Solenoid_Motion** 선택 ⟸ **형상과 부품설계 작업이 완료된 디자인**
3. **Open 버튼 클릭**
4. **Components 단계 이동**
   - Toolbar > Components Tab 선택

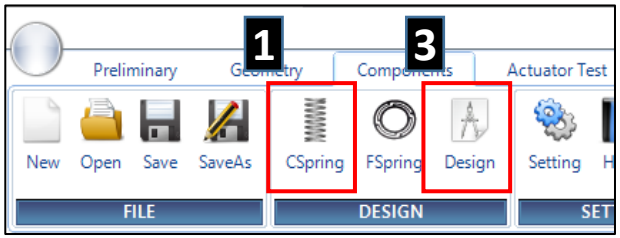


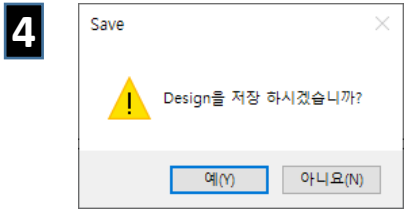


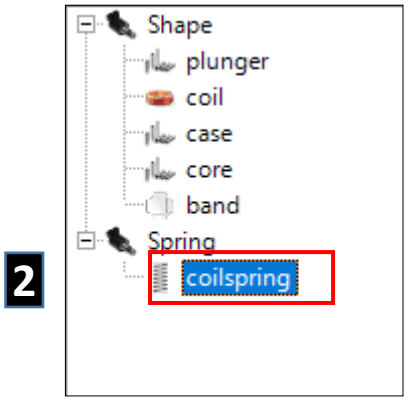


Spring 설계

1. **Coil Spring 추가**
   - Toolbar > CSpring 클릭
2. **사양 변경**
   - coilspring 선택
   - Wire Diameter : **0.5**
3. **Toolbar > Design 버튼 클릭**
4. **Toolbar > Save 버튼 클릭**







2

coilspring	
Part Name	coilspring
Spring Constant[N/m]	539,37
Initial Force[N]	-0,6742
Free Length[mm]	7
Installation Length[mm]	5,75
Installation Posotion	UPPER_SIDE
Wire Diameter[mm]	0,5
Spring Diameter[mm]	3,5
Spring Turns[Turns]	8
Experiment Coefficient	0,91
Part Material	SUS301

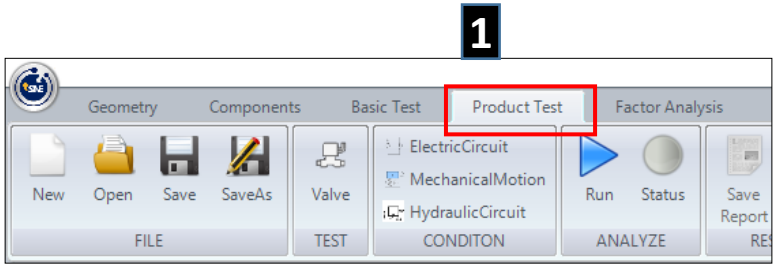
coilspring	
Part Name	coilspring
Spring Constant[N/m]	1616,71
Initial Force[N]	-2,0209
Free Length[mm]	7
Installation Length[mm]	5,75
Installation Posotion	UPPER_SIDE
Wire Diameter[mm]	0,5
Spring Diameter[mm]	3,5
Spring Turns[Turns]	8
Experiment Coefficient	0,91
Part Material	SUS301

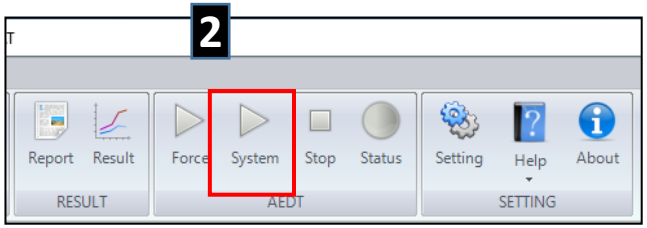
Maxwell Solver 실행

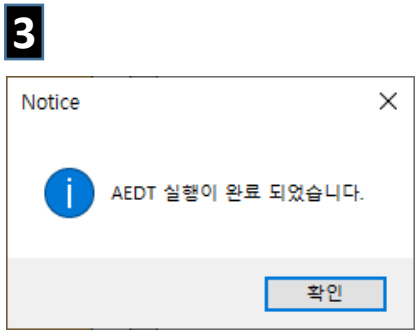
1. **Product Test 단계 이동**
   - Toolbar > Basic Test Tab 선택

2. **Solver 실행**
   - Toolbar > AEDT > System 클릭

3. **실행 확인 (약 1분 소요)**
   - AEDT 실행 완료 메시지 창 확인



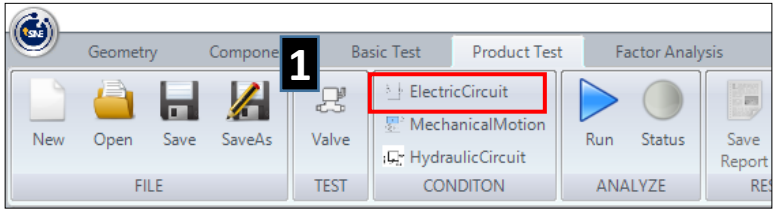




전기회로 설정

1. **전기회로 추가**
   - Toolbar > ElectricCurcuit 클릭

2. **전기회로 속성 변경**
   - Circuit Type : **UNIPOLAR_TR**
   - Duty : **0.65**
   - Time Step : **0.05**



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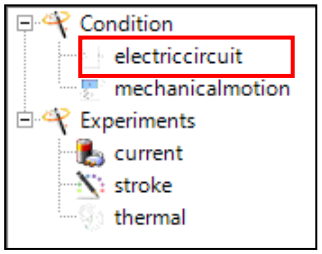
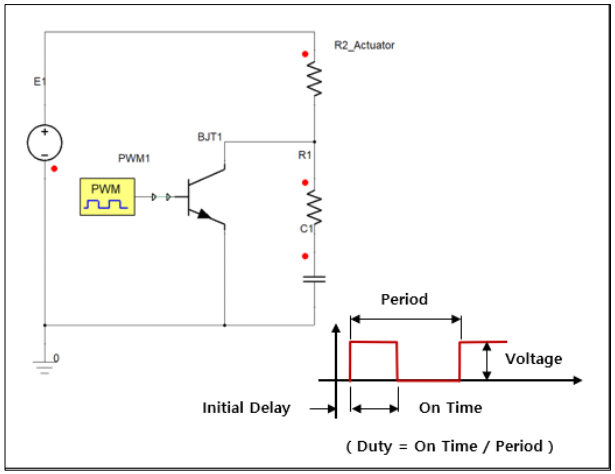


2

electriccircuit	
Condition Name	electriccircuit
Circuit Type	UNIPOLAR_TR
Protection Circuit Type	RC_SNUBBER
Voltage[V]	14,5
Current[A]	1,405
Duty	0,65
Period[ms]	20
Frequency[Hz]	50
Initial Delay[ms]	0
Snubber Resistance[Ω]	300
Snubber Capacitor[C]	3,3E-06
Time Step[ms]	0,05

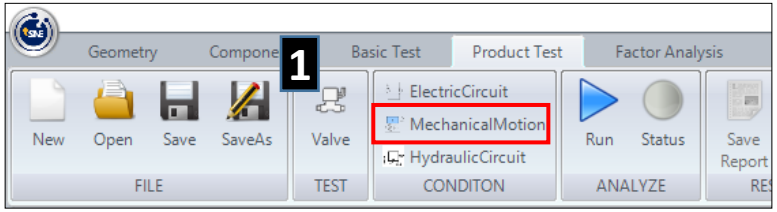


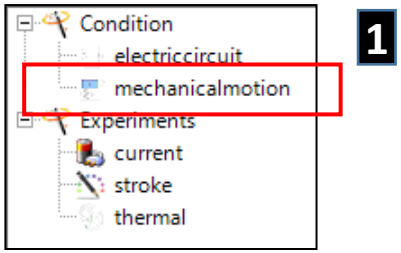
기계운동 설정

1. **기계운동 추가**
   - Toolbar > MechanicalMotion 클릭

2. **기계운동 속성 변경**
   - First Spring Name : **coilspring** 선택
   - Upper Stroke Limit : **1.5**
   - Magnetic Force Ratio : **0.95**
   - Side Force Ratio : **0.323**

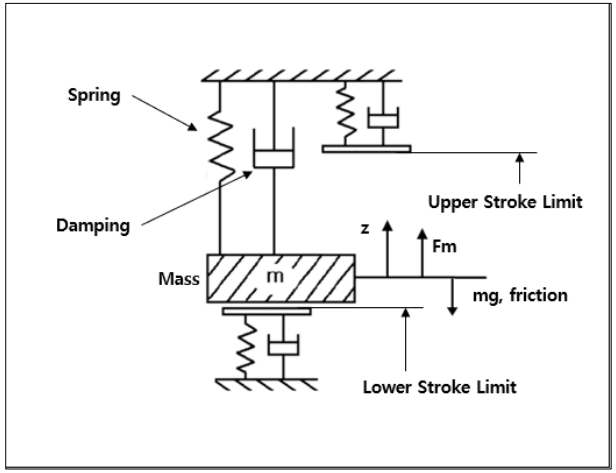
   (0.323 = 7.84 / 24.2 = 측력 / 자기력)





4

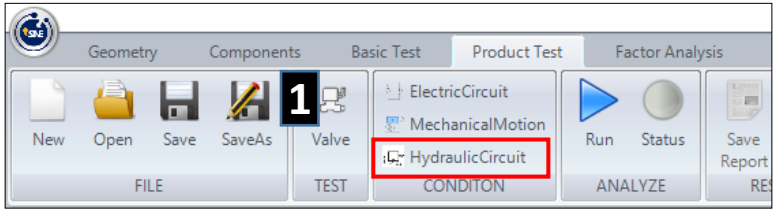
mechanicalmotion	
Condition Name	mechanicalmoti
Mass[g]	3
Gravity Condition	GRAVITY_OFF
Damping[N·s/m]	0.1
First Spring	coilspring
Second Spring	
Upper Stroke Limit[mm]	1.5
Lower Stroke Limit[mm]	0
Magnetic Force Ratio	0.95
Friction Coefficient	0.2
Side Force Ratio	0.323

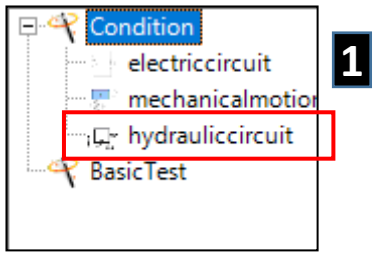


밸브 설정

1. **유압회로 추가**
   - Toolbar > HydraulicCurcuit 클릭

2. **밸브 속성 변경**
   - 기본값 그대로 사용

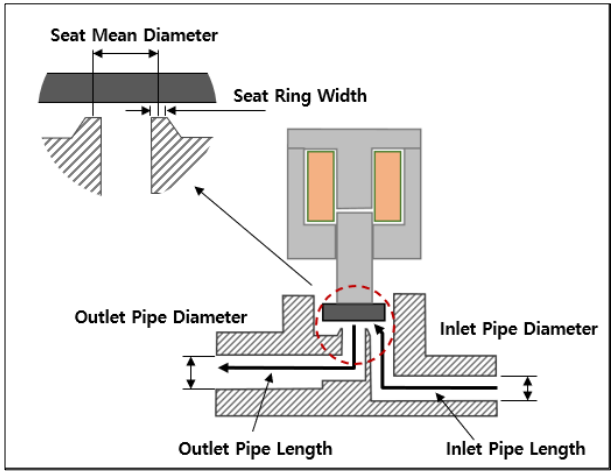




1

2

hydrauliccircuit	
Condition Name	hydrauliccircui
Flow Coefficient	0.72
Orifice Diameter[mm]	2
Minimum Area[mm²]	3.14
Fluid Material	Water
Inlet Pipe Diameter[mm]	10
Inlet Pipe Length[mm]	100
Inlet Pressure[Pa]	100000
Outlet Pipe Diameter[mm]	10
Outlet Pipe Length[mm]	100
Outlet Pressure[Pa]	0
Seat Mean Diameter[mm]	2.3
Seat Ring Width[mm]	0.3

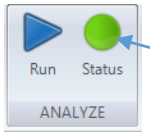


밸브 거동 해석

1. **Valve 실험 추가**
   - Toolbar > Valve 클릭

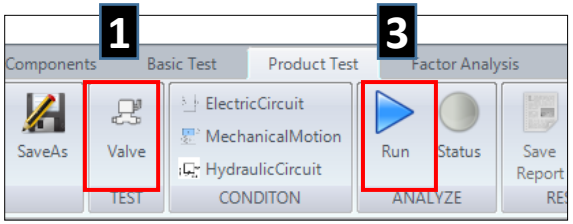
2. **실험조건 선택 (속성 창)**
   - Electric Circuit > **electriccircuit** 선택
   - Mechanical Motion > **mechanicalmotion** 선택
   - Hydraulic Circuit > **hydraliccircuit** 선택
   - Total Simulation Time : **20**

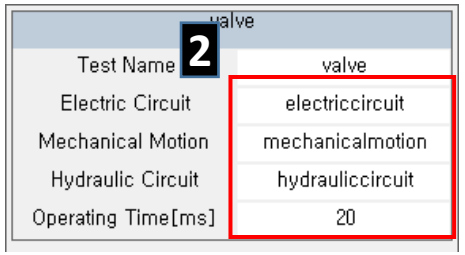
3. **거동 실험**
   - Toolbar > Run 클릭 (약 15분 이상 소요)

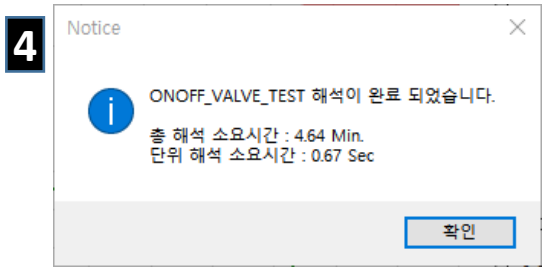


해석 중 표시

4. **Valve 실험 완료**
   - 해석 완료 메시지 창 확인



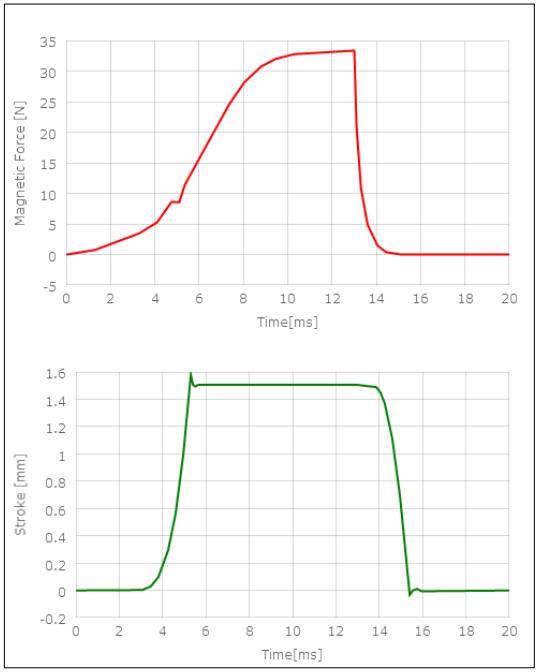




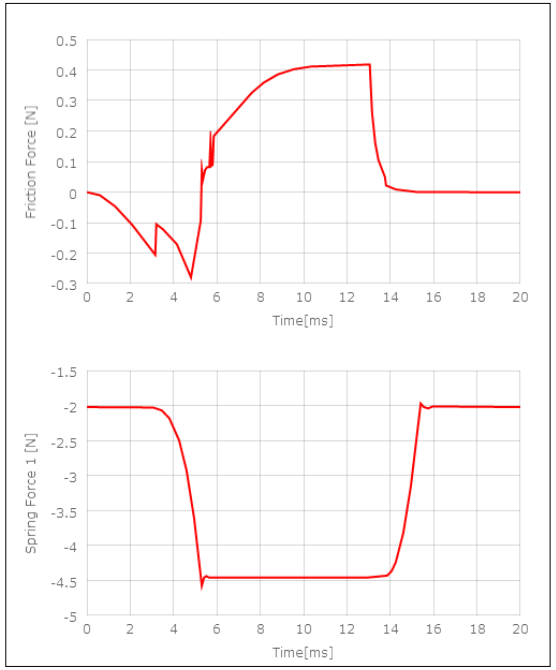
해석 결과 다음 페이지

밸브 거동 해석 결과

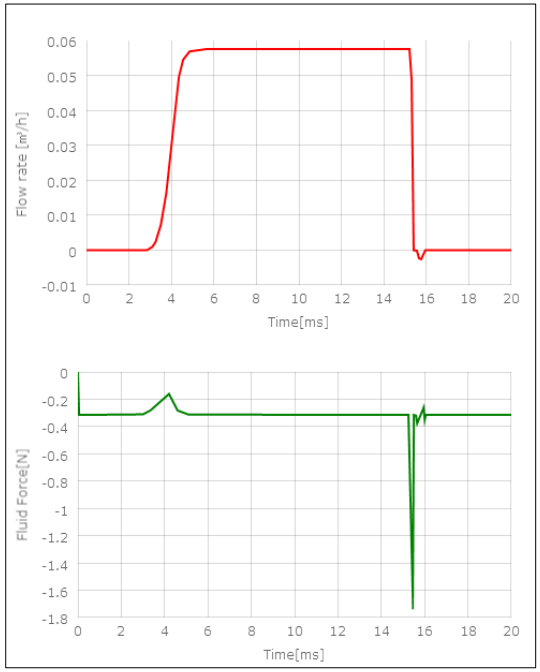
1. 변위, 자기력



2. 마찰력, 스프링력



3. 유량, 유체력



감사합니다

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