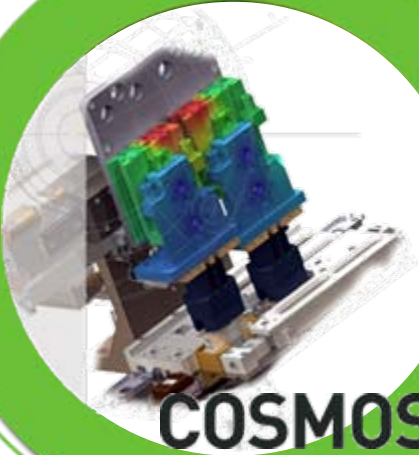




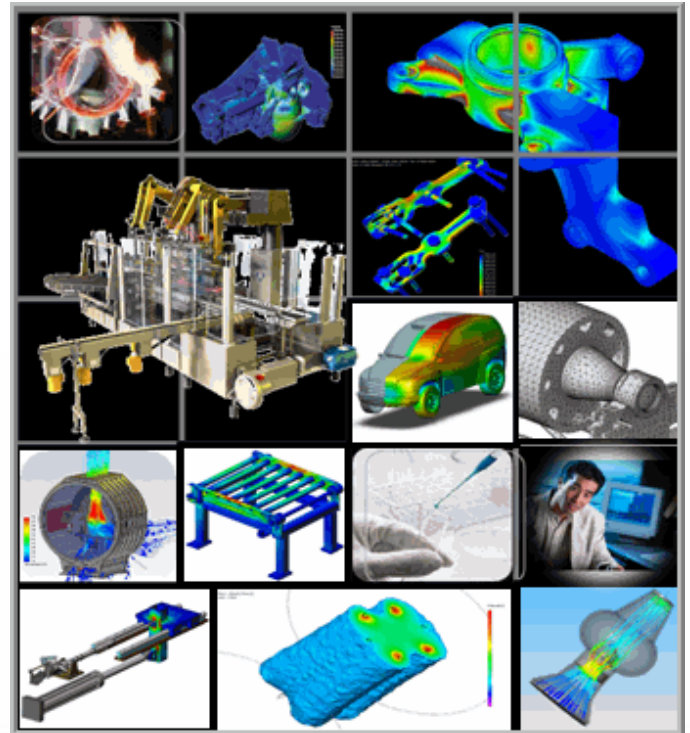
# COSMOS를 활용한 새로운 정유압식 구동계 모델의 설계 검증

- Valentin Technologies, Inc -



PRISM Co., Ltd

<http://www.prism21.co.kr>  
prismco@prism21.co.kr



# 목 차

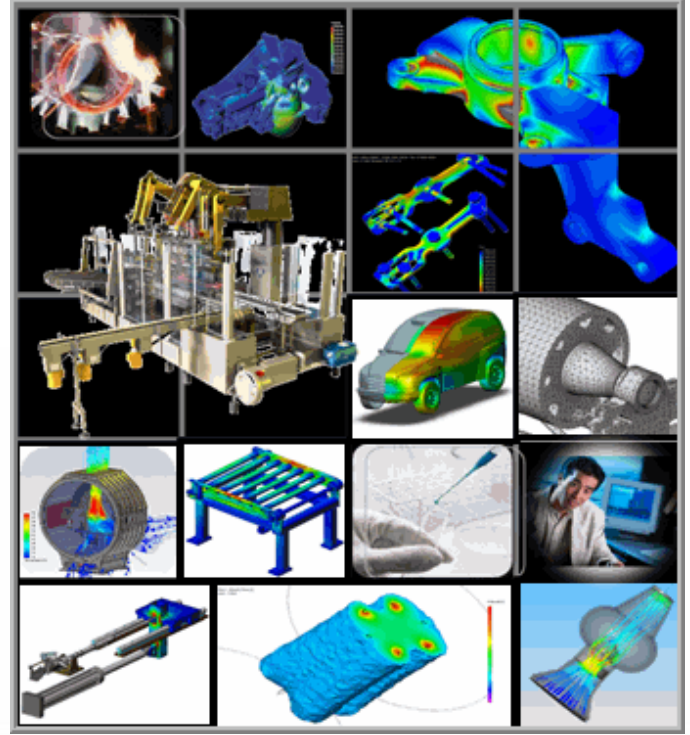
1. Introduction
2. Design
3. Analysis
4. Next Steps
5. Animation
6. Q&A





**COSMOS™**

# 1. Introduction



# VALENTIN TECHNOLOGIES, INC



## ■ Valentin Technologies, Inc.

- 1982년, 미국 위스콘 주
- 새롭고, 더 가벼운 엔진/구동계 개발
- Hydrostatic Powertrain: 에너지 저장 장치를 가진 정유압식 구동계
- US Patents: 6,293,231 6,484,674
- US Patents: 4,615,257 6,406,271

## ■ 발표 자료

- January 23, 2006 SolidWorks World 2006
- 발표자: Ingo Valentin



# Introduction



## ■ HST (HydroStatic Transmission)

- 별도의 발진장치(Clutch, torque converter)가 없이 원동기의 동력을 부하부에 출력되는 변속 및 동력전달장치
- 장점: 간편한 변속, 고효율, 고압화, 고속화, 환경 친화적
- 단점: 경제성, 소음 문제

## ■ 적용 분야

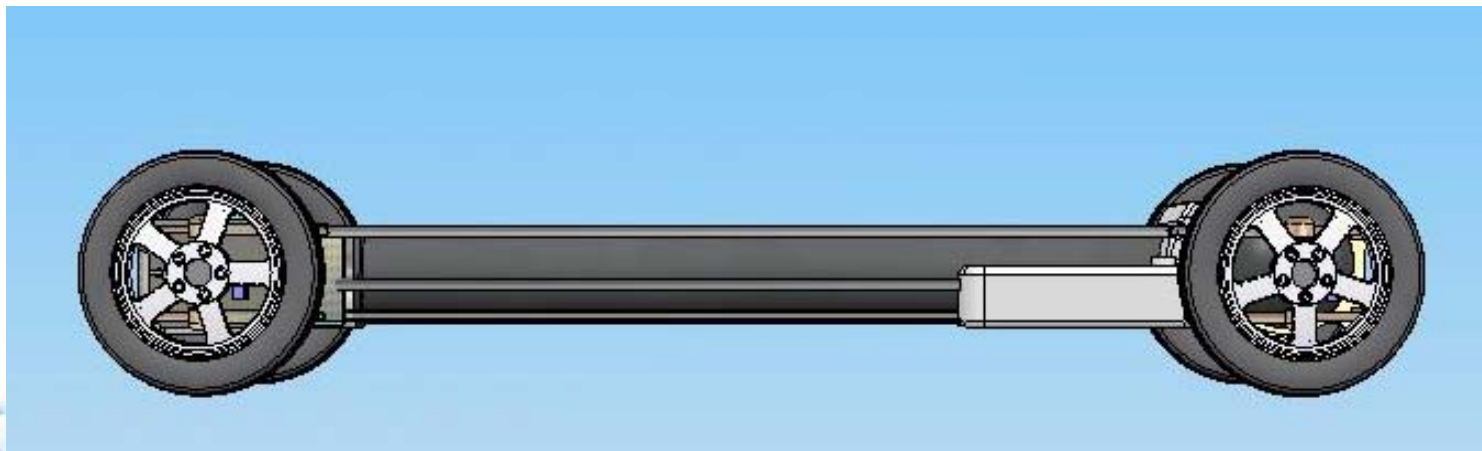
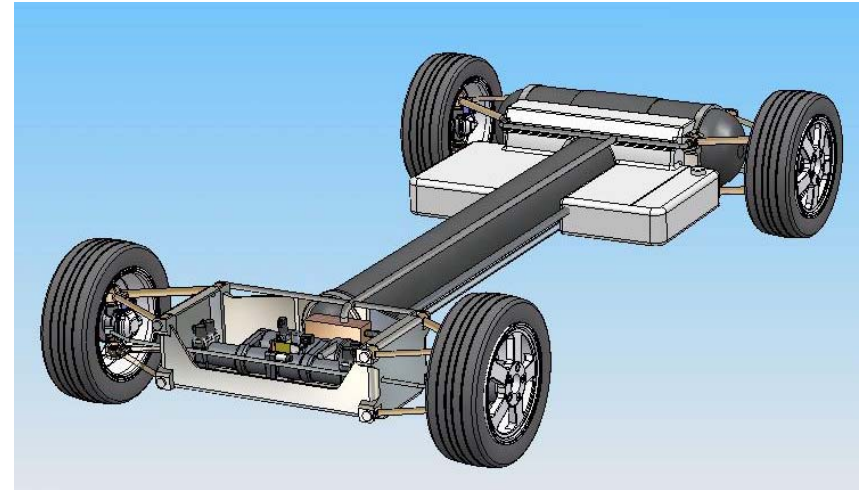
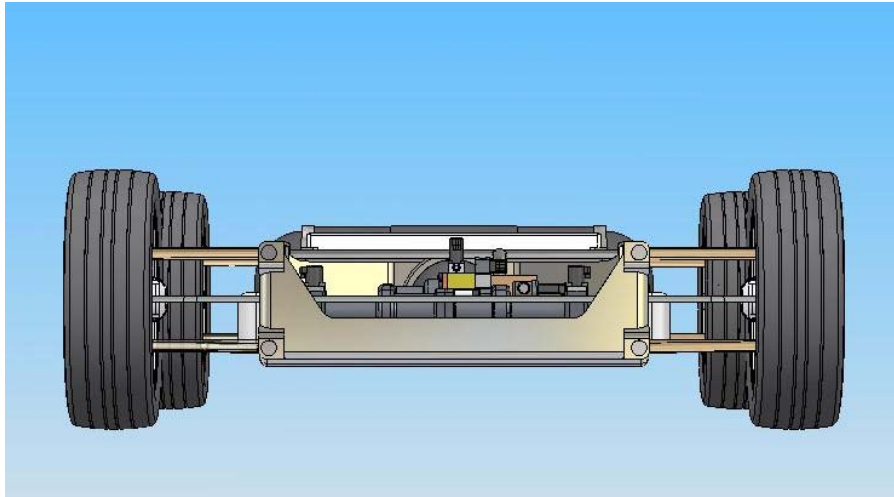
- 중대형 트럭용 무단변속기
- 환경친화형 버스 동력 절약 장치
- 군기동장비의 조향 및 변속장치



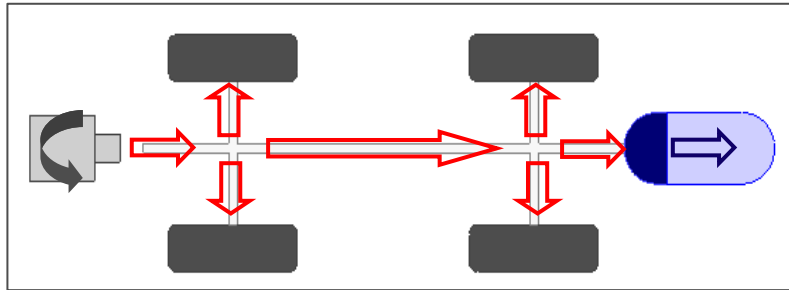
# Hydrostatic Powertrain



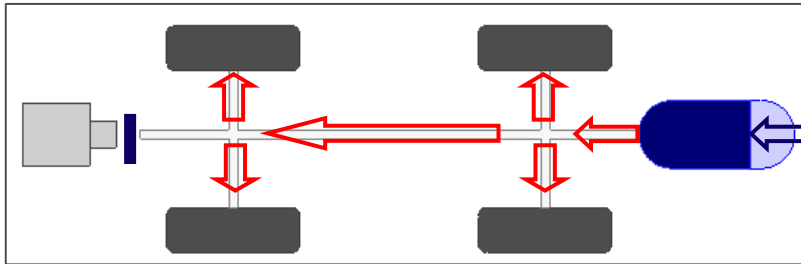
- Car Platform



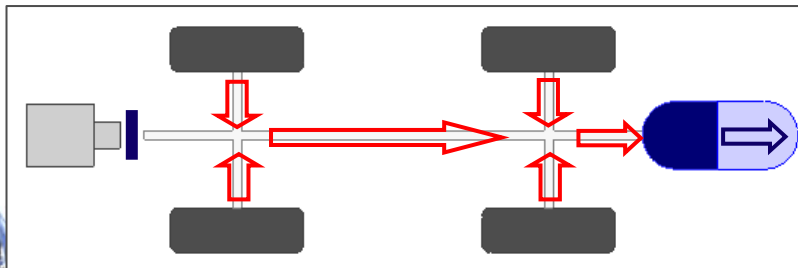
# 작동 원리



The Free-Piston Engine pumps fluid into an Accumulator - and will be turned off when the accumulator is filled.



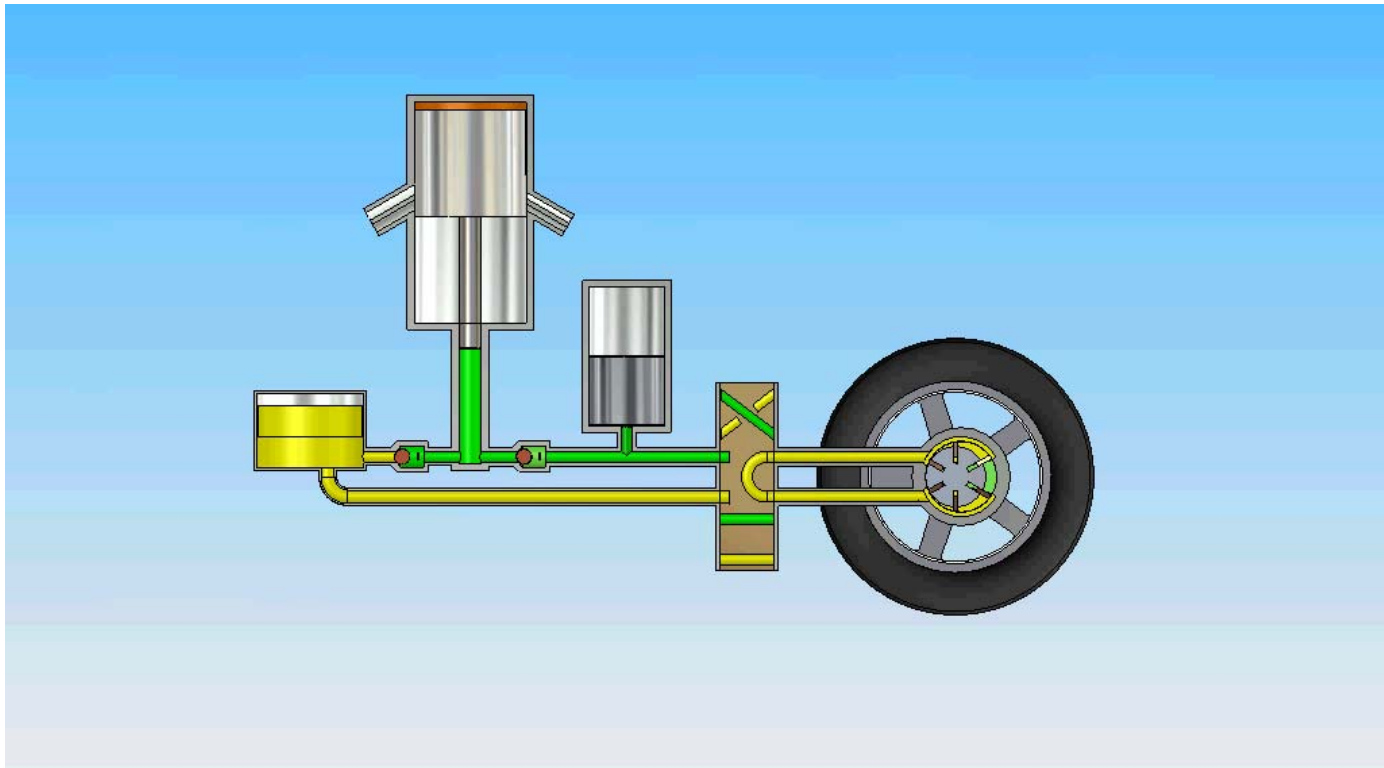
The pressurized fluid from the accumulator drives the hydraulic motors – one in each wheel.



During braking, the motors are reversed into pumps – pumping all the energy from braking back into the accumulator

**The engine runs only at constant speed and power when charging the accumulator – the best conditions for low consumption and emissions.**

# 작동 원리







- **Free-Piston Engine**  
Simply transfers combustion pressure into hydraulic pressure. High power density. Less pressure and temperature sensitive than crankshaft engines.
- **Hydraulic Accumulator**  
Stores the energy in form of pressurized fluid. High rates of charge and discharge.
- **Hydraulic Wheelmotors**  
Drive all four wheels. Brake the car and restore all energy back into the accumulator. (750 hp) Very high power density. Full torque over whole speed range.



# 주요 부품



Type: Free-Piston Diesel

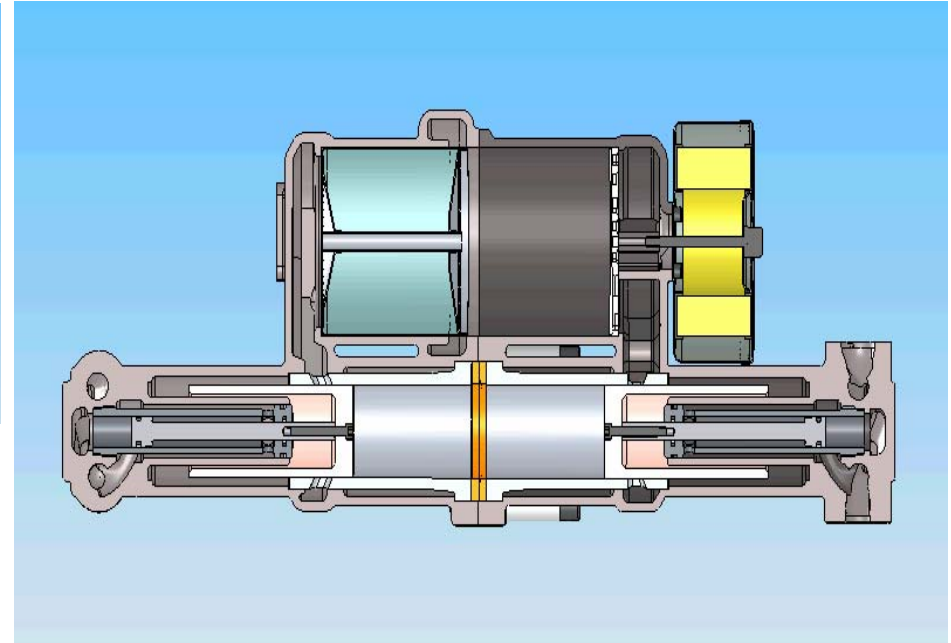
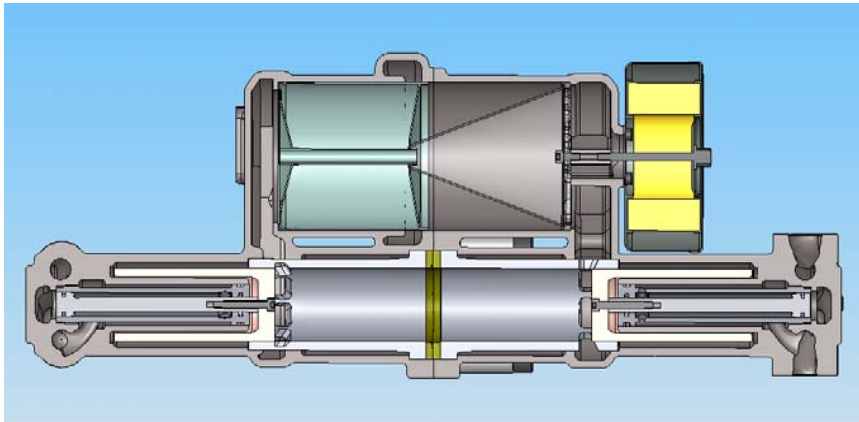
Data: 60 hp @ 2,600 1/min

Pulse-pressure Charger

27" x 12" x 8"

Circumferential Fuel Injection

75 lbs



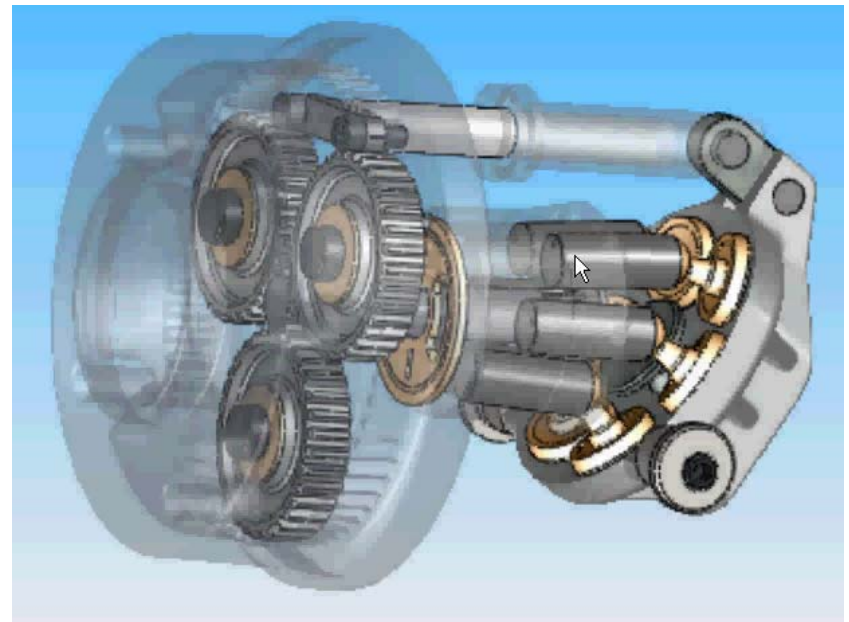
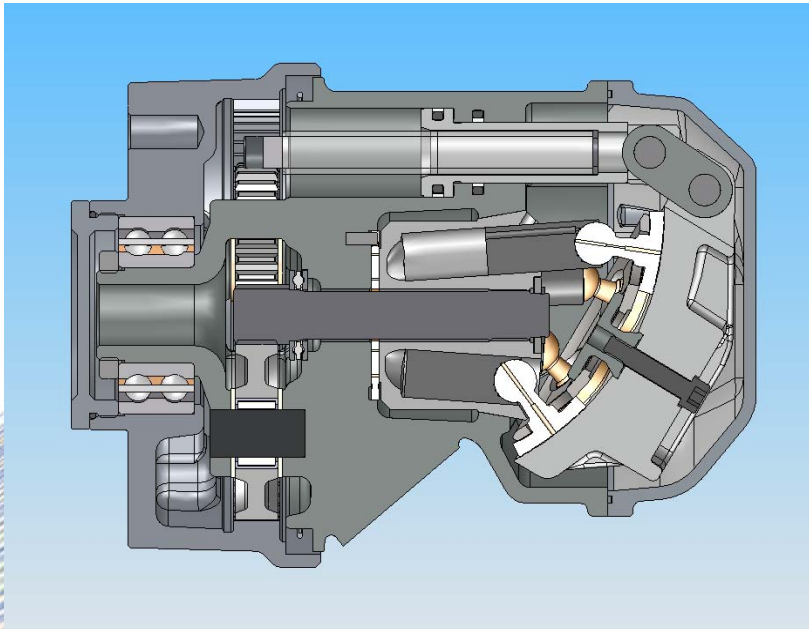


## Hydraulic Motor: Axial-Piston Type

270 hp, 8,800 rpm

6½" x 7" x 8½"

25 lbs



# Hydrostatic Powertrain의 잇점

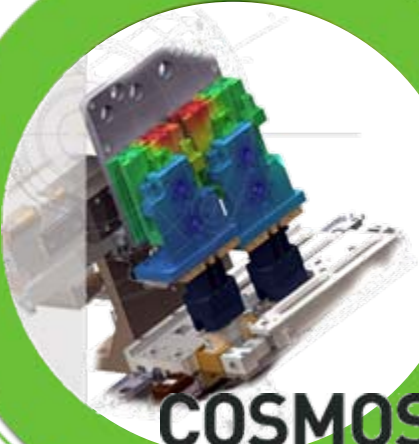


- **Hydrostatic Powertrains use fluid to transmit the power from the engine to the wheels.**
  - Advantages:
    - Easy control of power
    - High power density.
    - Storage of energy
  
- **The concept simplifies the conversion and transmission of energy in cars.**
  - Reducing:
    - Energy consumption
    - Emissions
    - Weight and Size
  
- **Passenger Car**
  - 140 mpg (2 L/100km)
  - 1/8 emissions
  - Efficient conversion, transmission and re-use of energy
  - Low weight and size of Powertrain
  - Constant combustion conditions

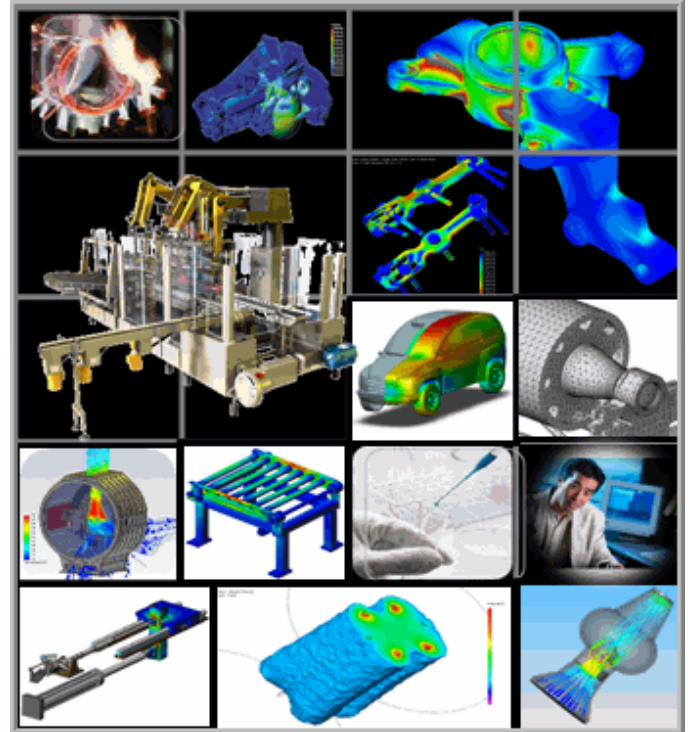




## 2. Design



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# Development Cycle



## ■ Development Cycle

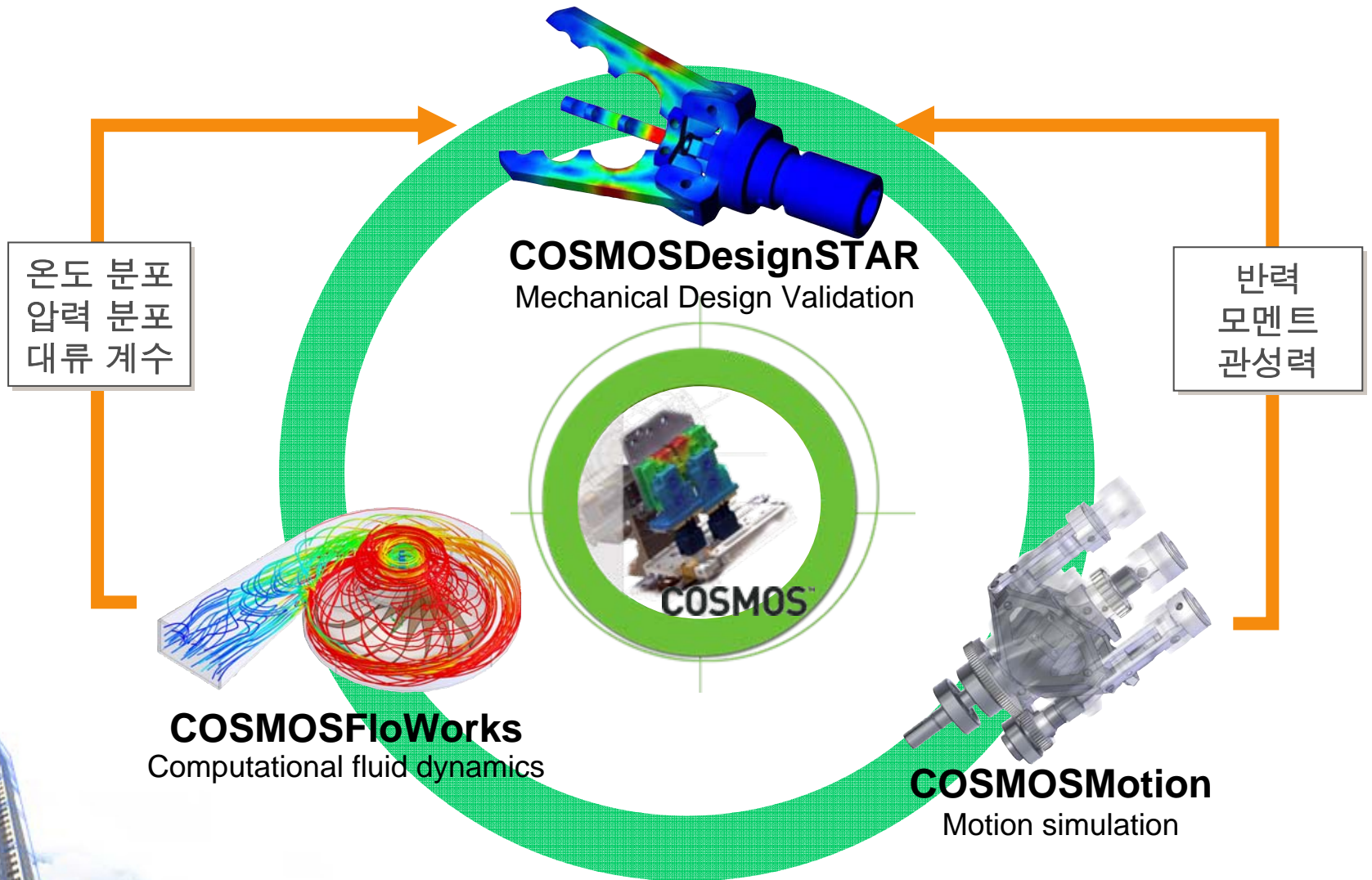
- |            |                      |                  |
|------------|----------------------|------------------|
| – Input    | Data – Assumptions   |                  |
| – Design   | Geometry Data        | SolidWorks       |
| – Analysis | Displacement         | COSMOSDesignSTAR |
|            | Force, Stress        |                  |
|            | Motion, Friction     | COSMOS Motion    |
|            | Cavitations, Leakage | COSMOS Floworks  |
| – Test     | Data - Findings      |                  |

## ■ Benefits

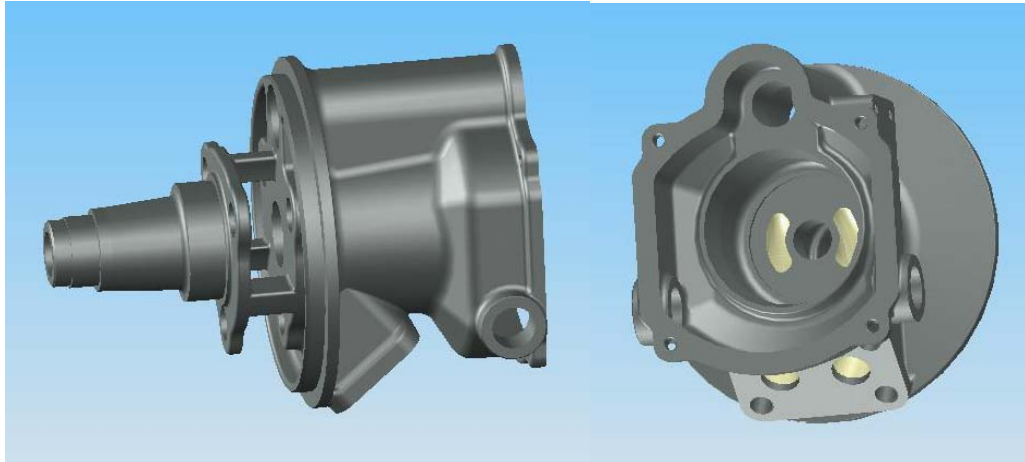
- Geometry data for Analysis, Manufacturing and Quality Control
- Parts: Manufacturing data, weights  
Lofted section for flow analysis.
- Assemblies: Displacements, interference, animation



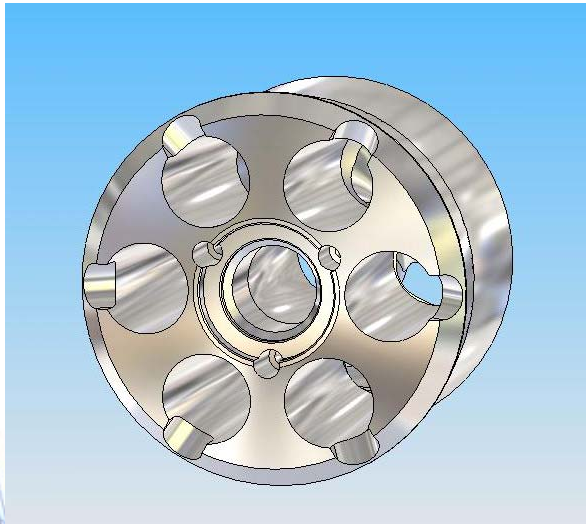
# Development Cycle



# Design: Samples



Motor housing



Cylinder



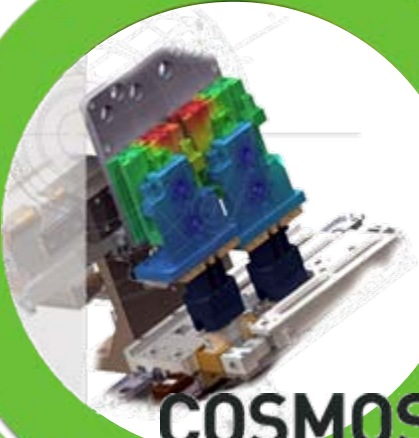
Piston-Shoe



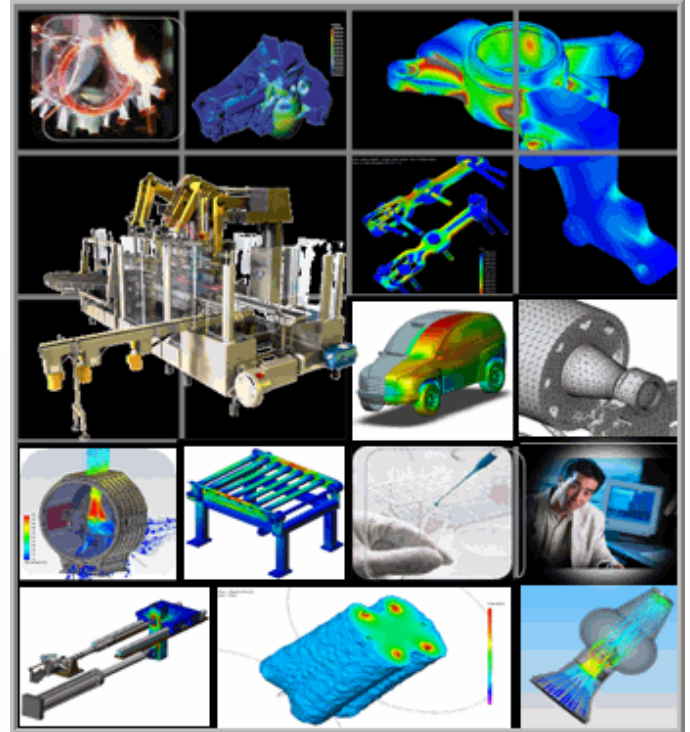




# 3. Analysis



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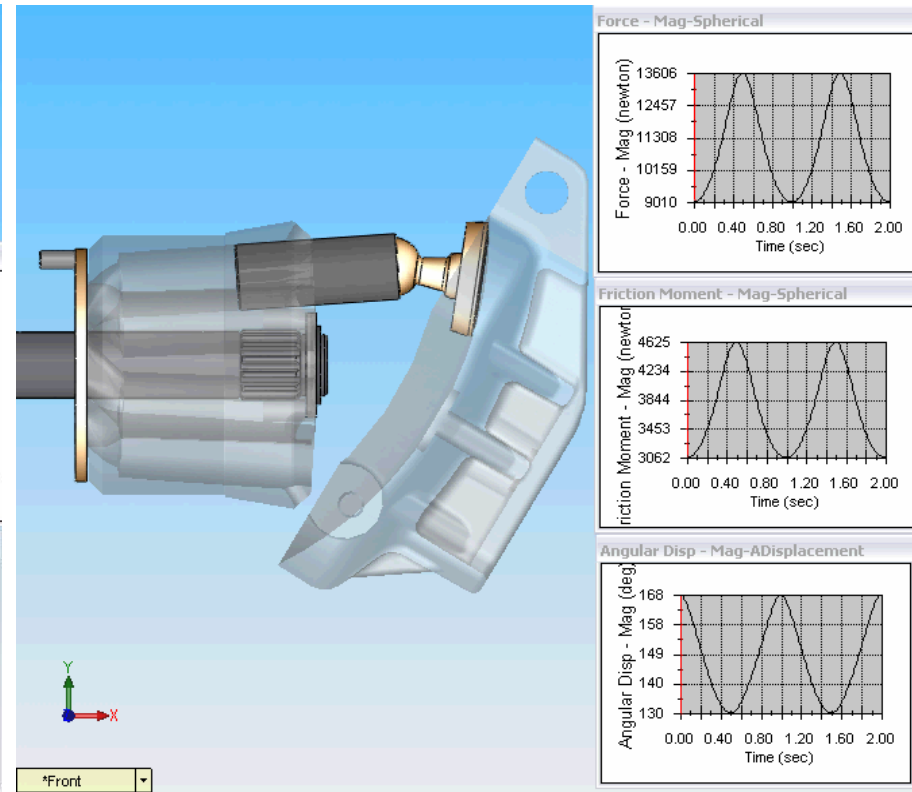
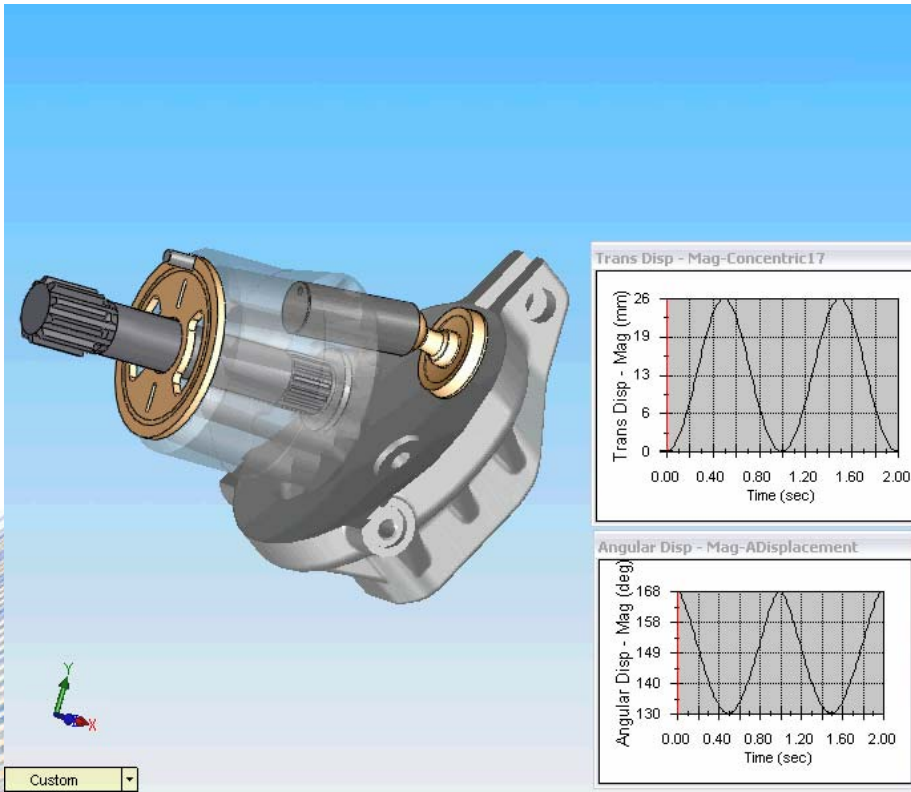


# Analysis of Motor



- Piston Stroke
- Joint Angle

- Force
- Friction
- Joint Angle

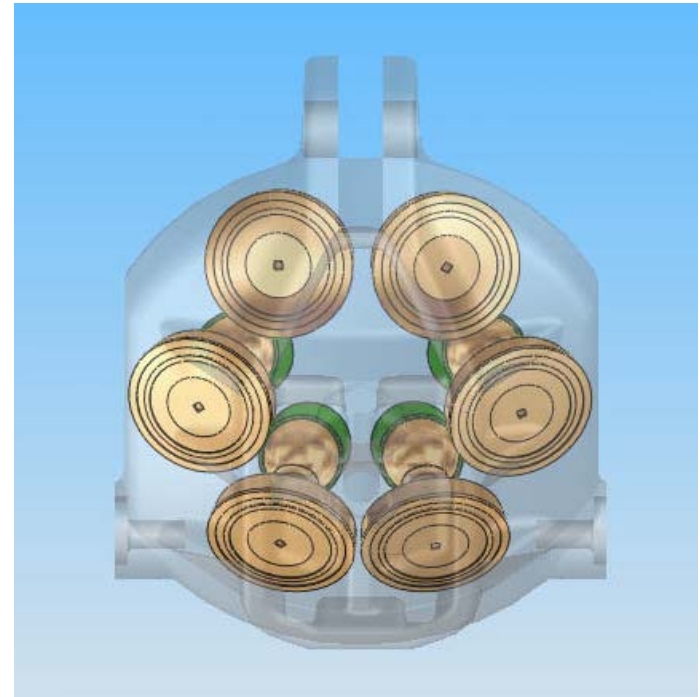
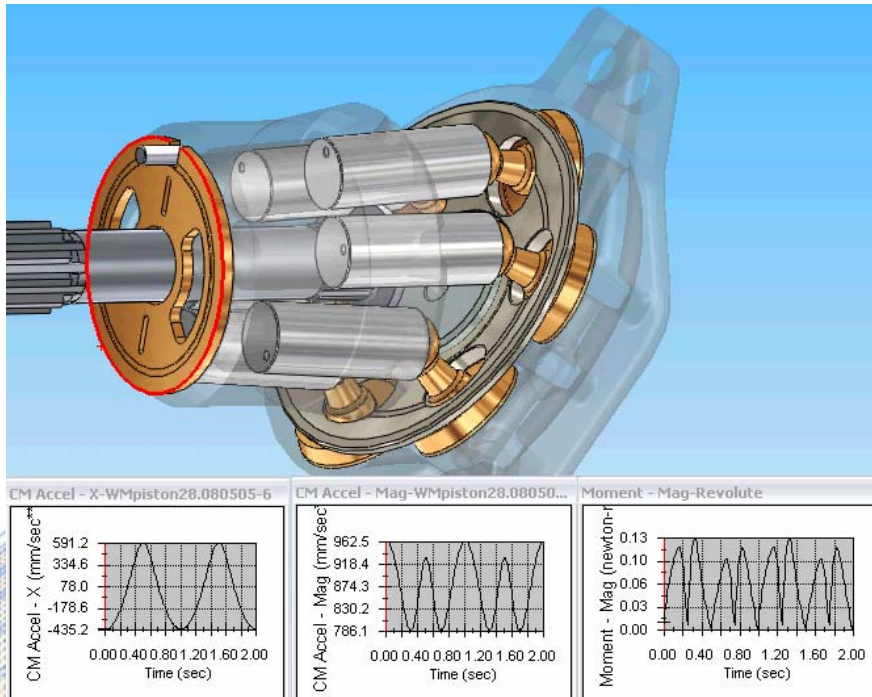


# Analysis of Motor



- Acceleration
- Torque

- Collision Detection



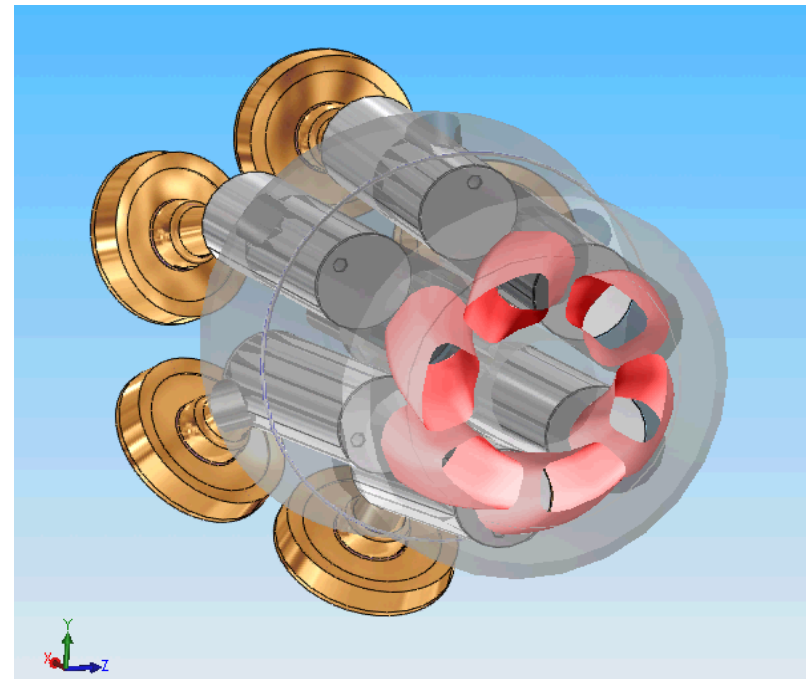
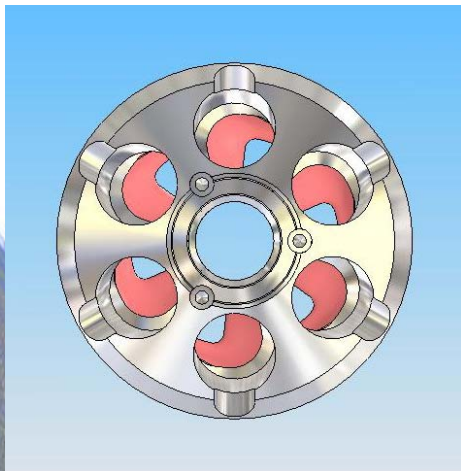
# Analysis of Cylinder



Critical dimensions are predominantly determined by other technical requirement than stress and deformation.

## Technical Data

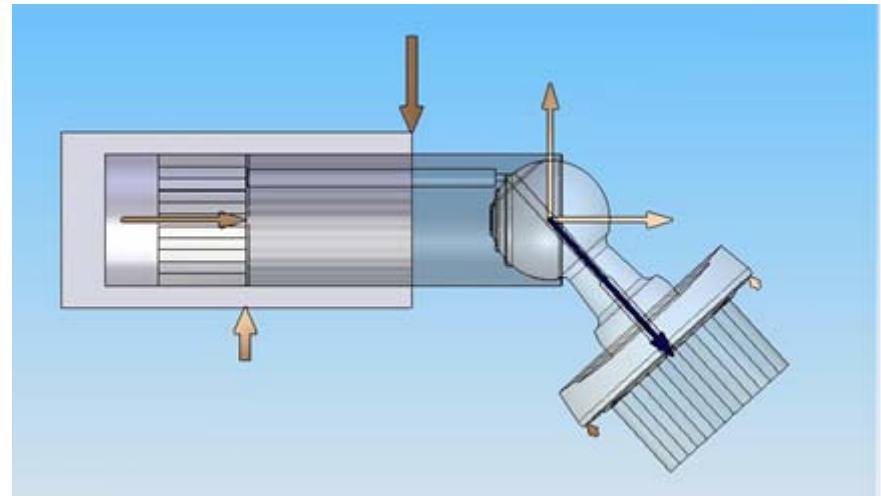
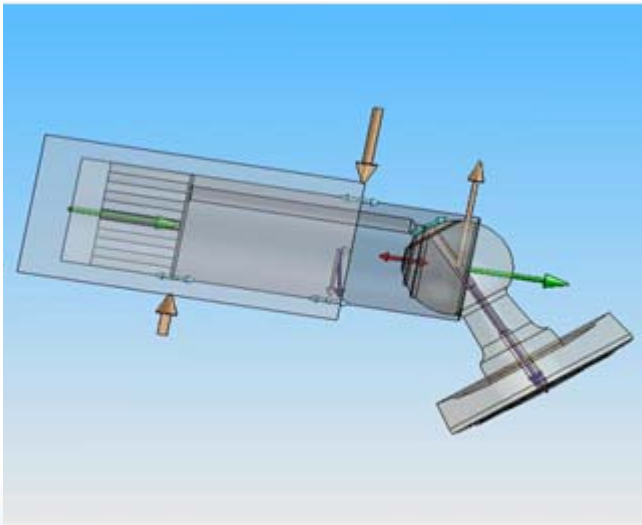
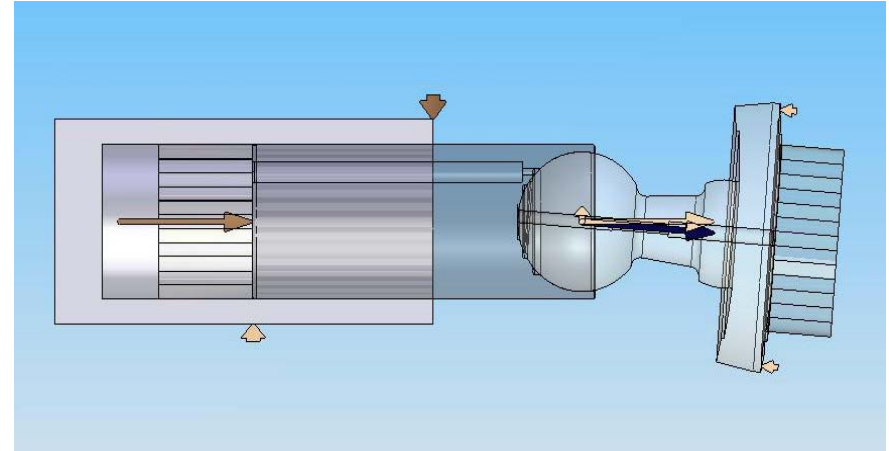
Dia x L	66 x 51 mm	2 3/4" x 2"
Weight	0.64 kg	1.4 lb
Power	200 KW	272 hp



# Analysis of Piston

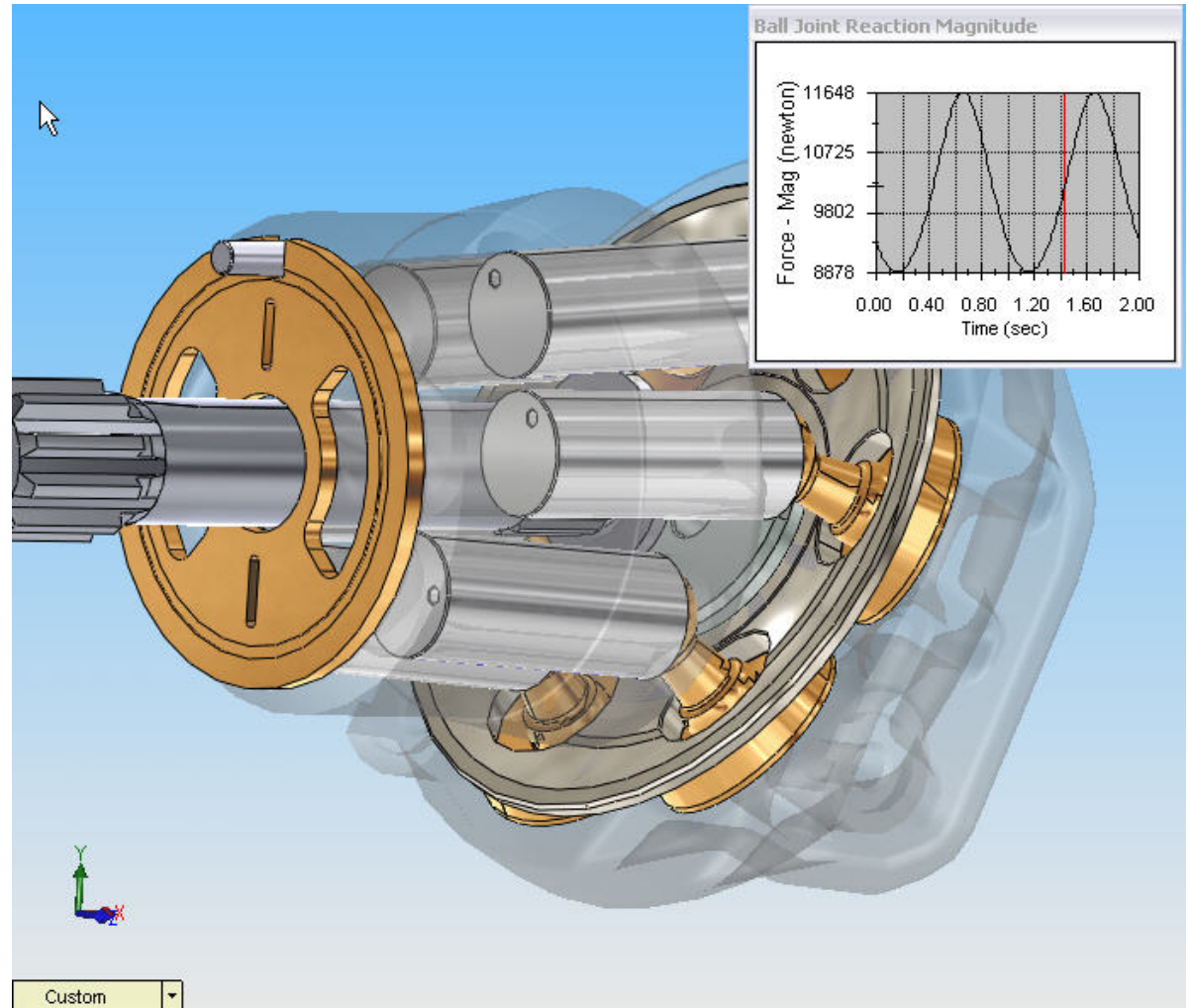


- Piston: Hydraulic, dynamic, shear forces
- Ball Joint: Pull-out force, throttle geometry position
- Shoe - Neck : Stress
  - Face: Deformation, pressure control, friction, leakage
- Joint : Friction



# Analysis of Piston

- Contact Force  
Face



# Analysis of Piston

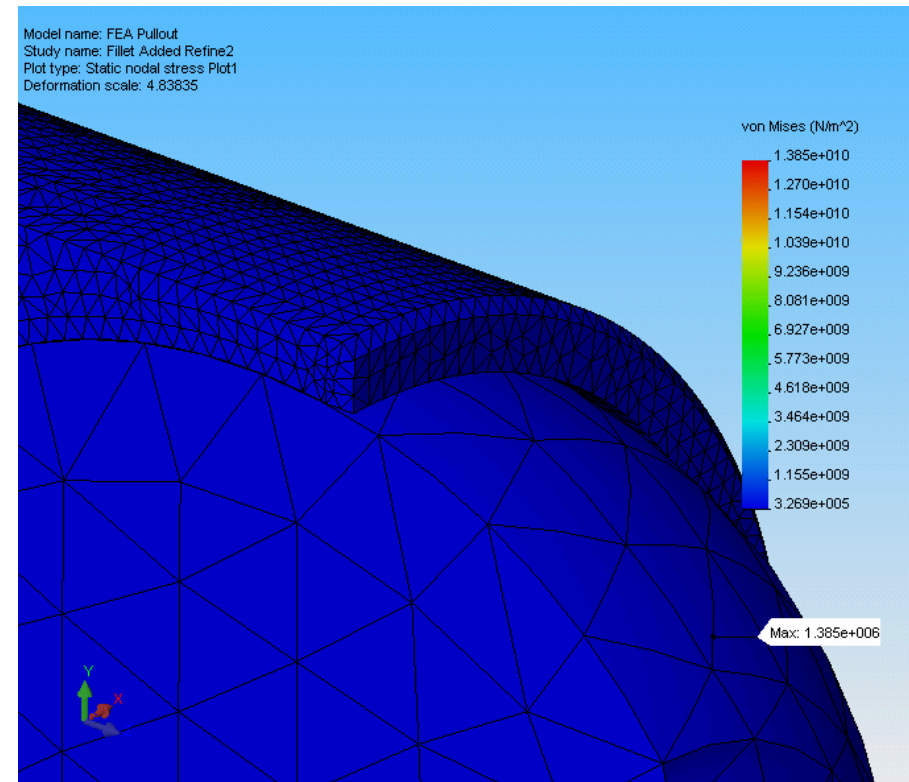
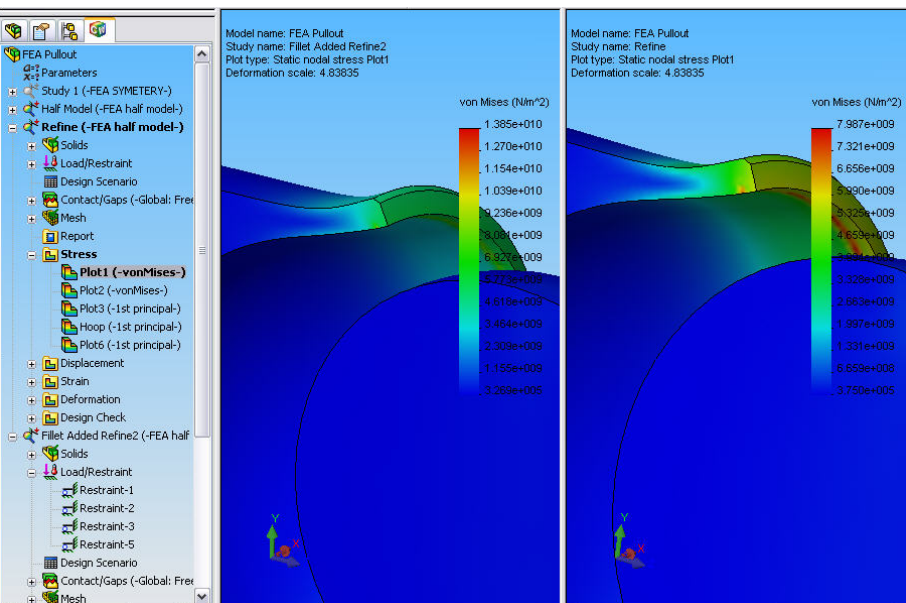


## ▪ Joint

- Pull-out Force - Refinement Comparison

## ▪ Joint

- Deflection



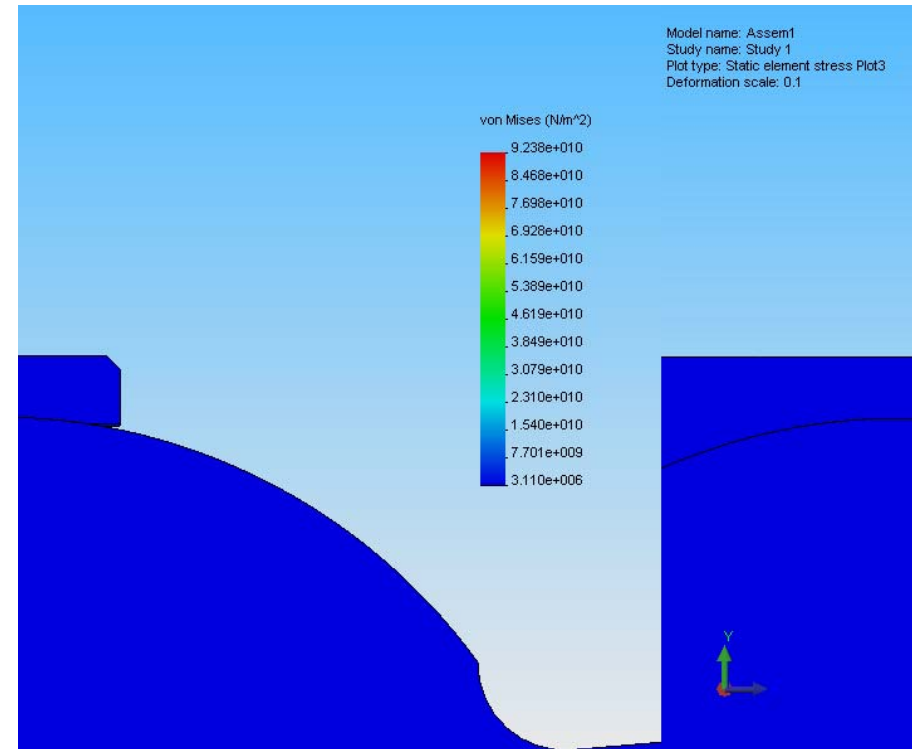
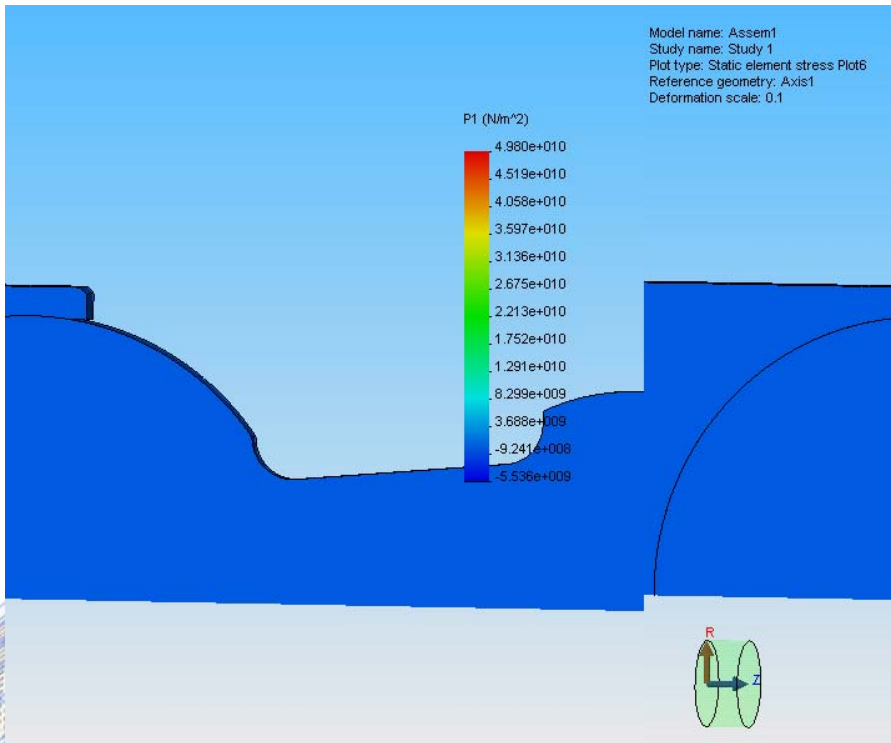


# Analysis of Piston

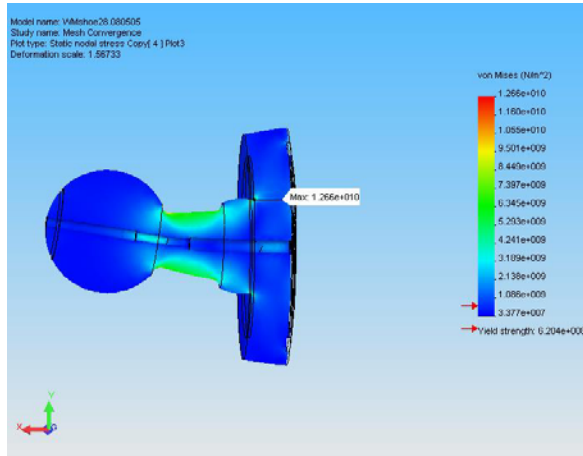


## ▪ Joint

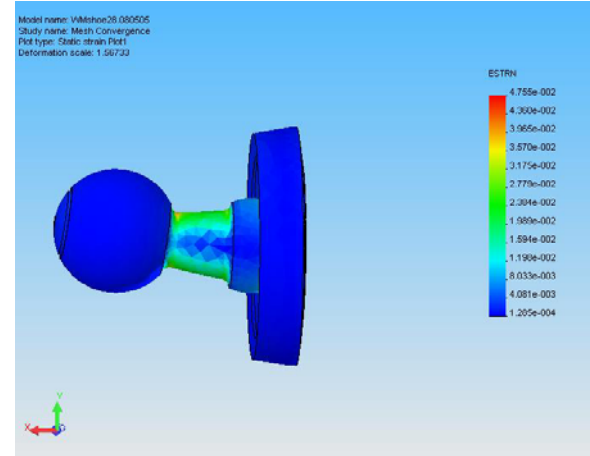
- Deflection



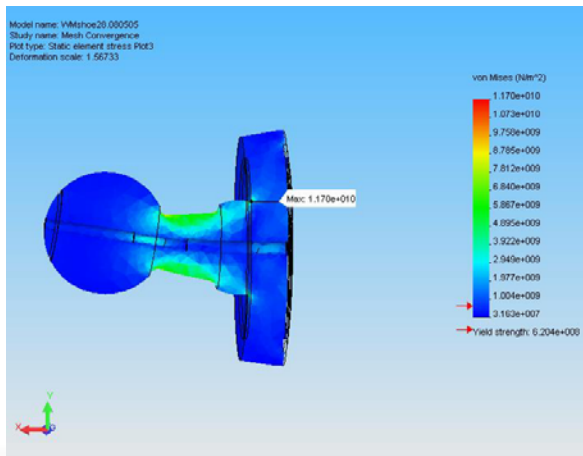
# Analysis of Piston



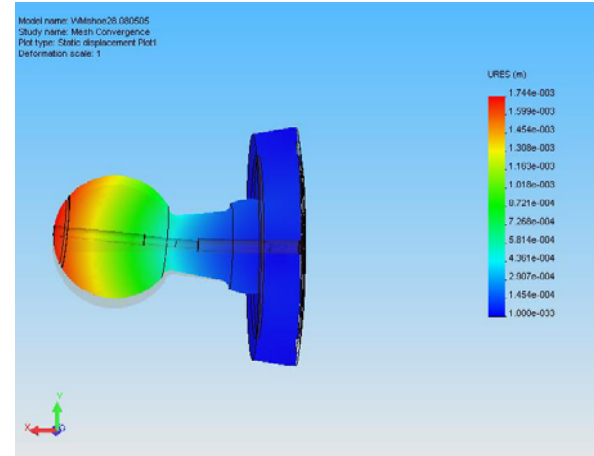
Static Nodal Stress



Static Strain



Static Element Stress



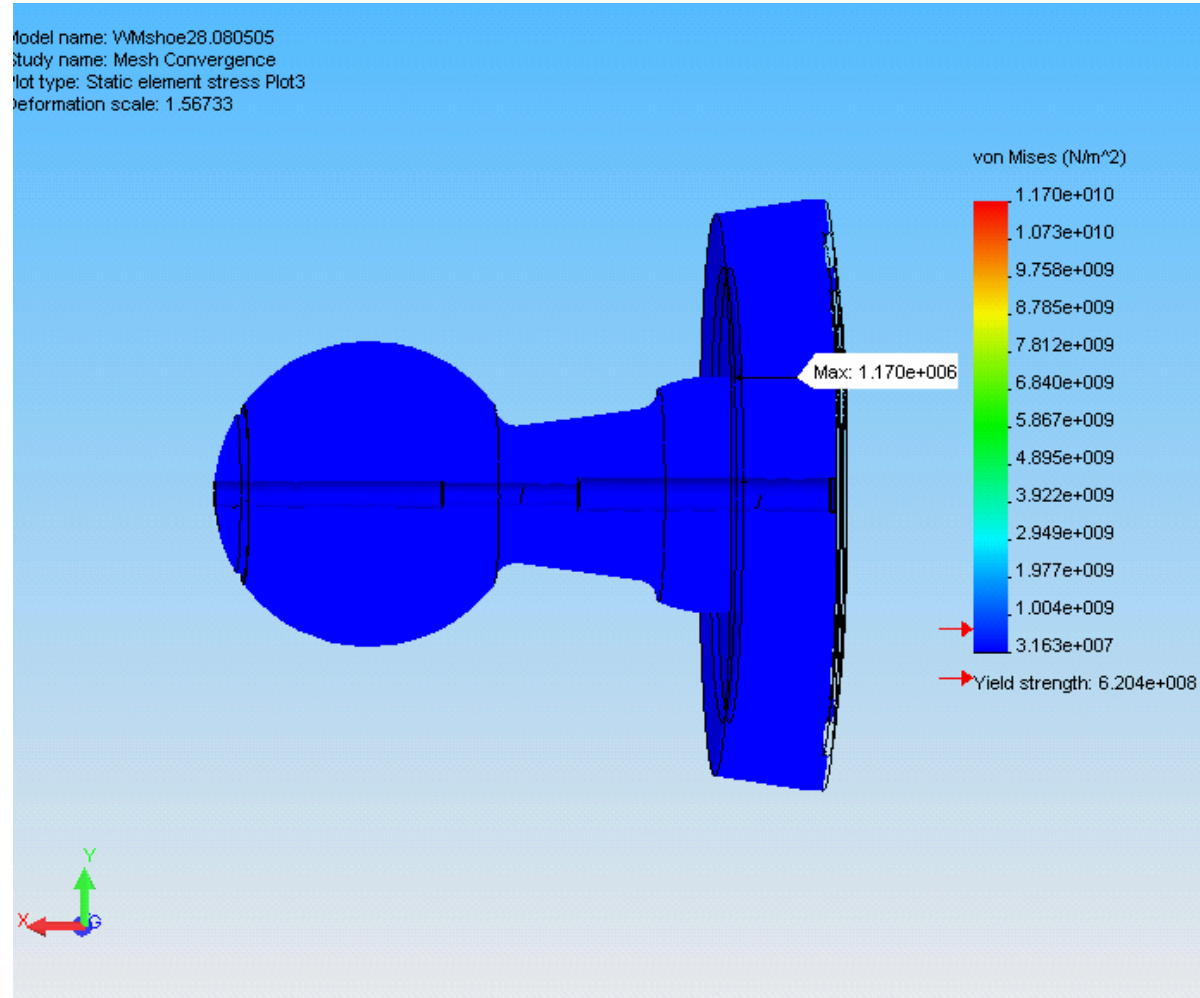
Displacement

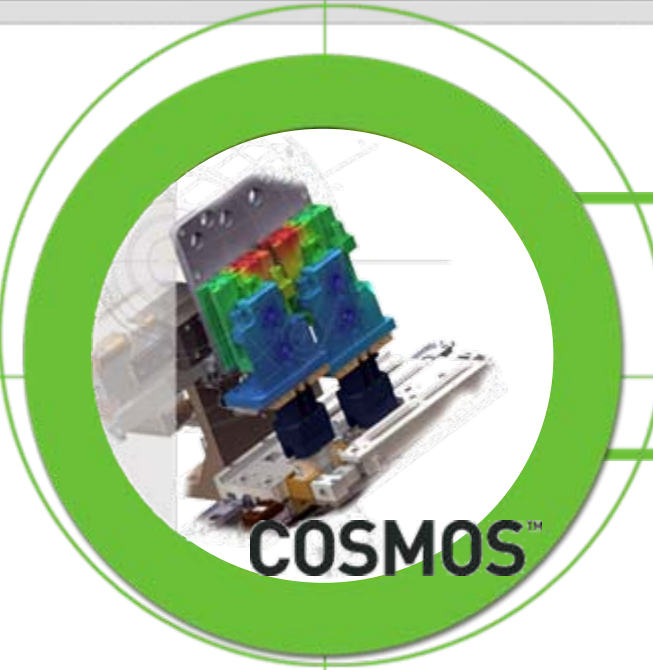


# Analysis of Piston

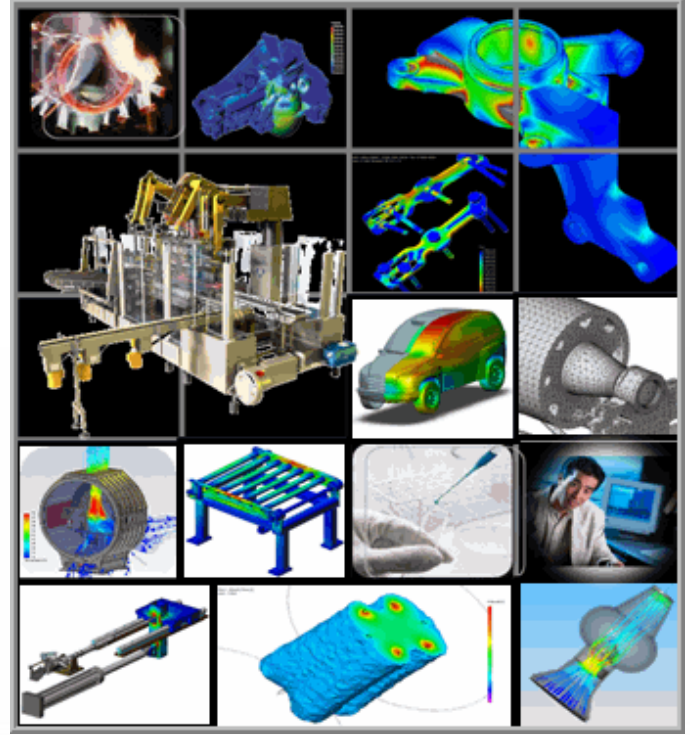


## Displacement





# 4. Next Steps



# Next Steps



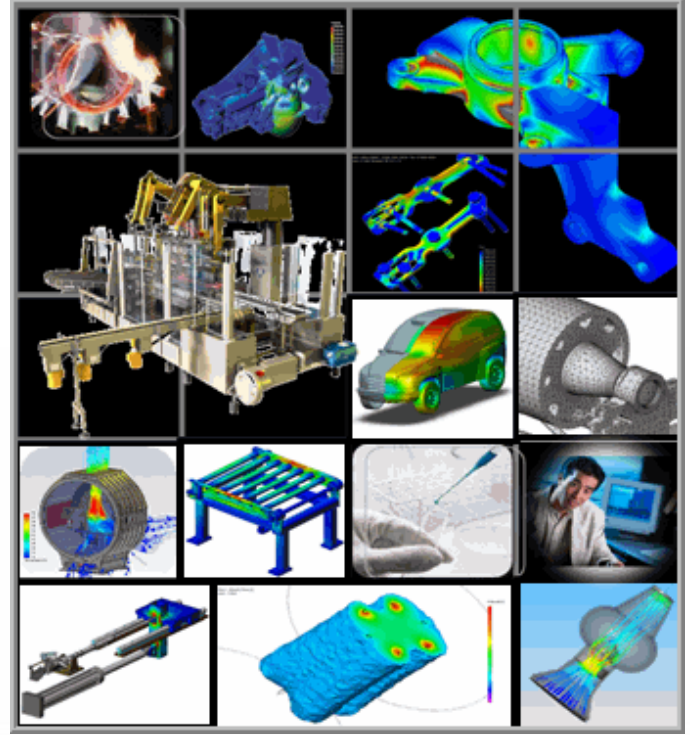
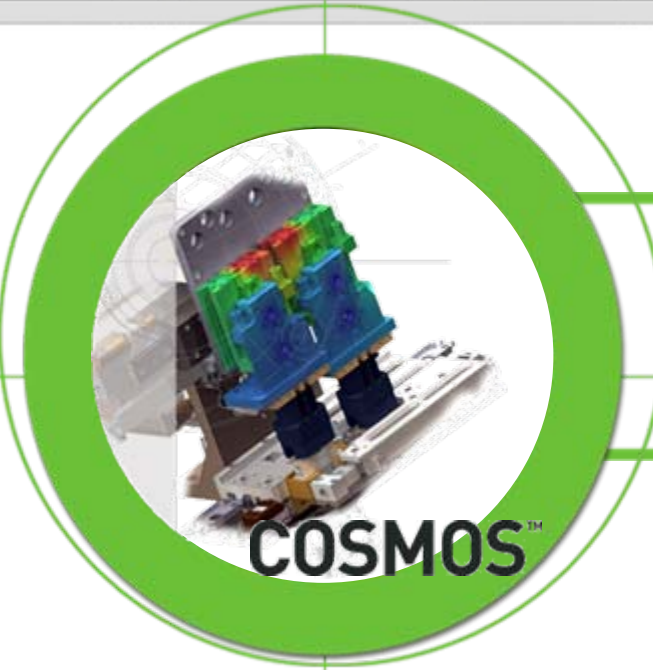
- **Engine**
  - Mechanical**      **Buckling, Deflection, Stress**
  - Flow**              **Intake, Exhaust**
  - Combustion**      **Scavenging, Combustion, Heat flow**
  - Thermal**           **Housing deformation, Exhaust**
  
- **Motor**
  - Flow**                **Cylinder Channel Geometry**
  - Friction**           **Piston bore, Cylinder bearings**
  - Leakage**
  - Test**                **Durability, Efficiency**

**All Data needed to update assumptions for simulations.**





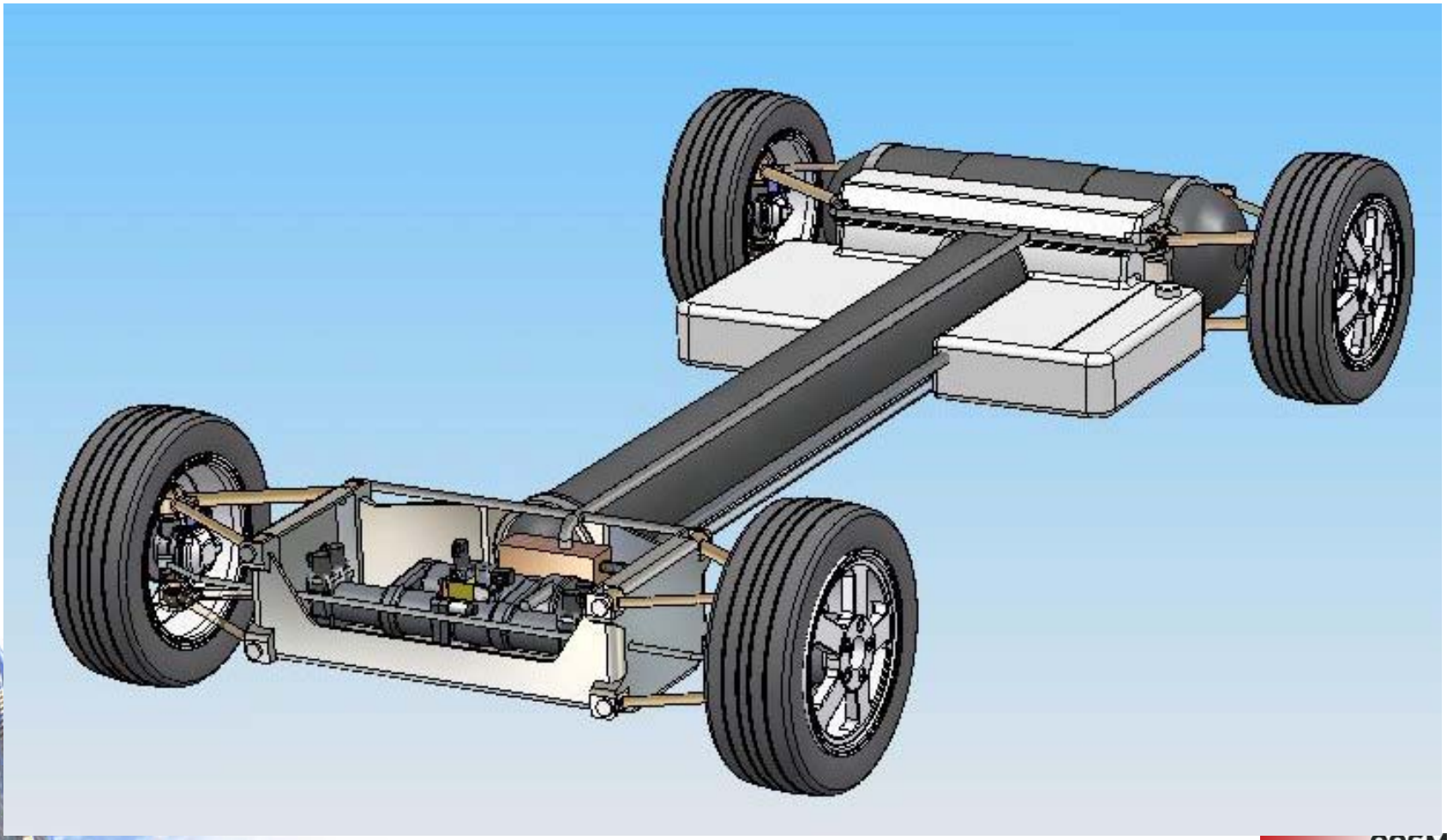
# 5.Animation



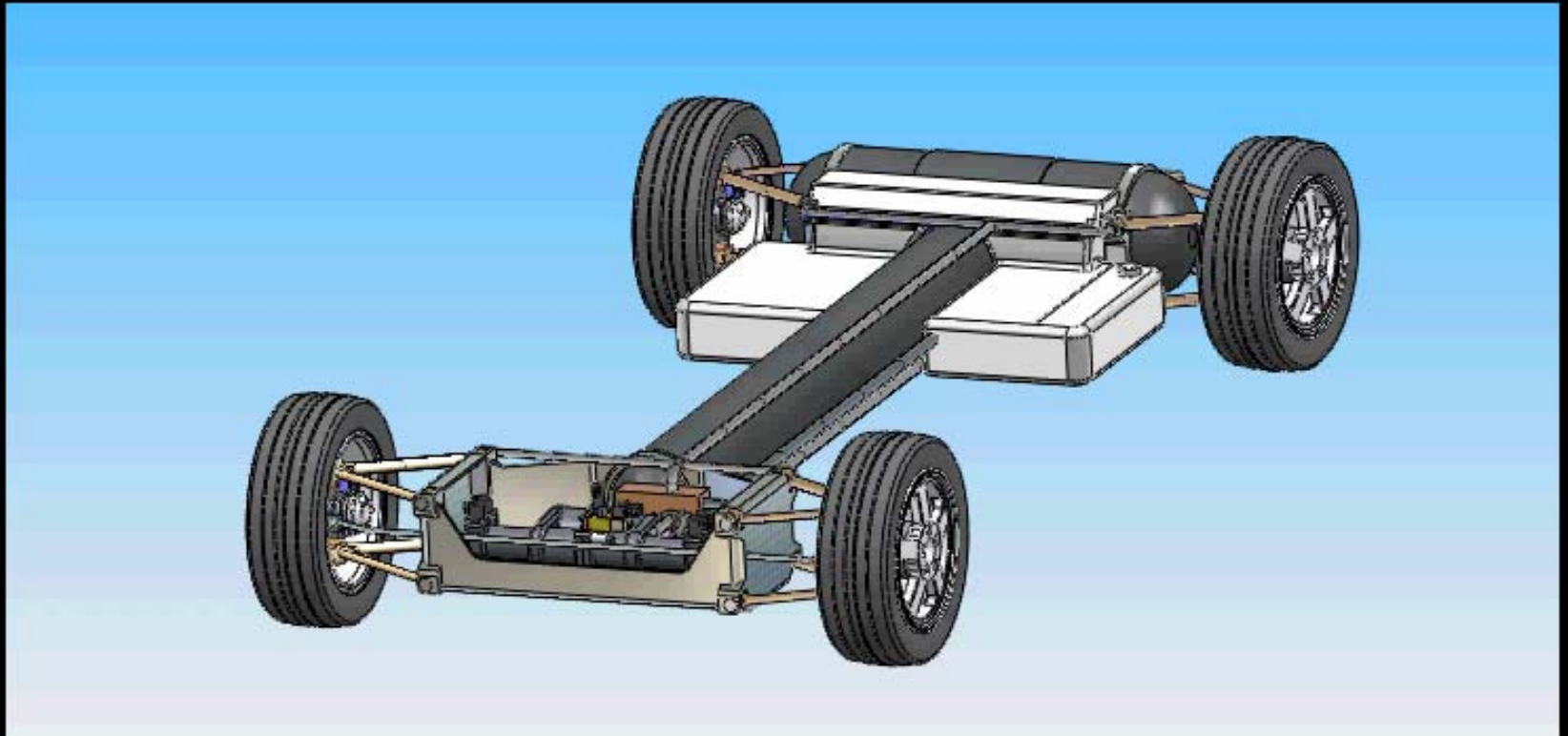
# Animation



## Car Platform



# Animation









# 감사합니다. !

프리즘 주식회사

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