

ASSEMBLY DESIGN

Computational Design Laboratory
Department of Automotive Engineering
Hanyang University, Seoul, Korea



한양대학교
HANYANG UNIVERSITY



CDL

Computational
Design
Lab

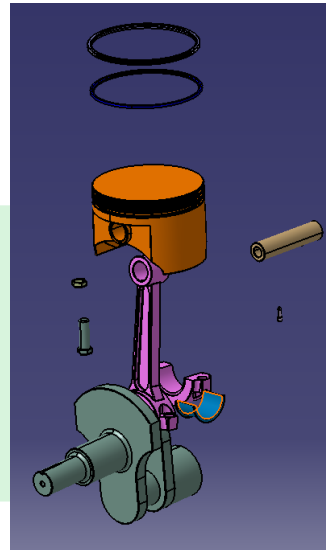
CONTENTS

- ✓ 시작하기
- ✓ Product Structure Tools
- ✓ Move
- ✓ Constraints
- ✓ Assembly Features Toolbar
- ✓ Space Analysis

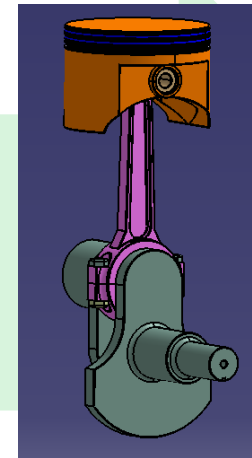
ASSEMBLY DESIGN



모델 불러오기



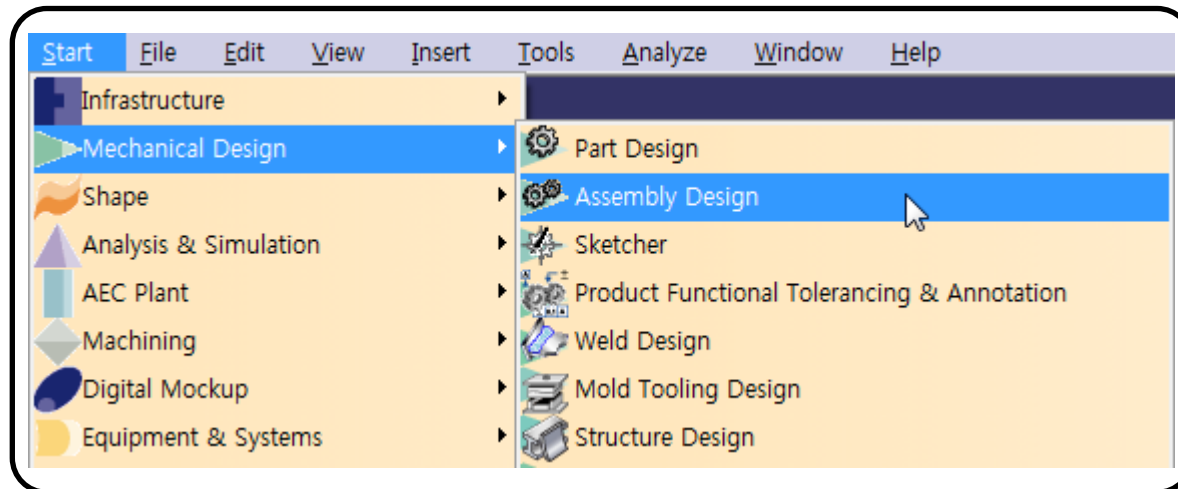
대략적 배치/수정



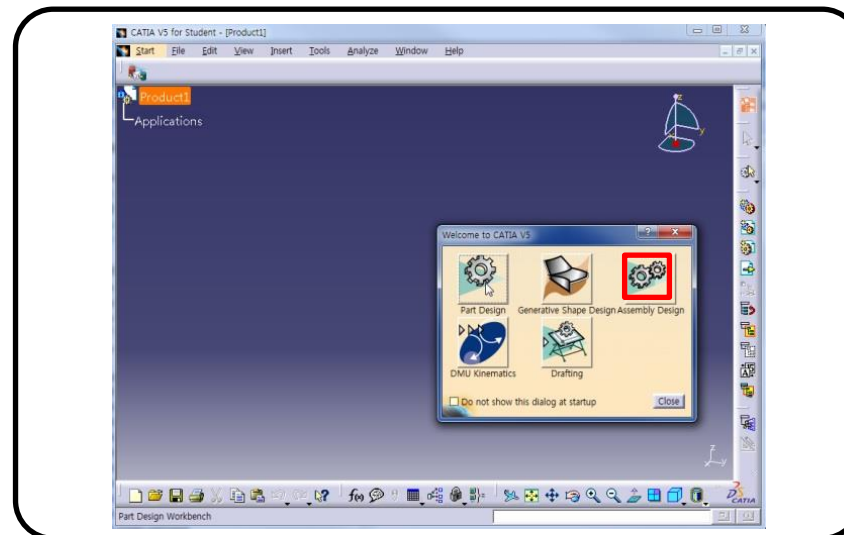
조립

ASSEMBLY DESIGN 시작하기

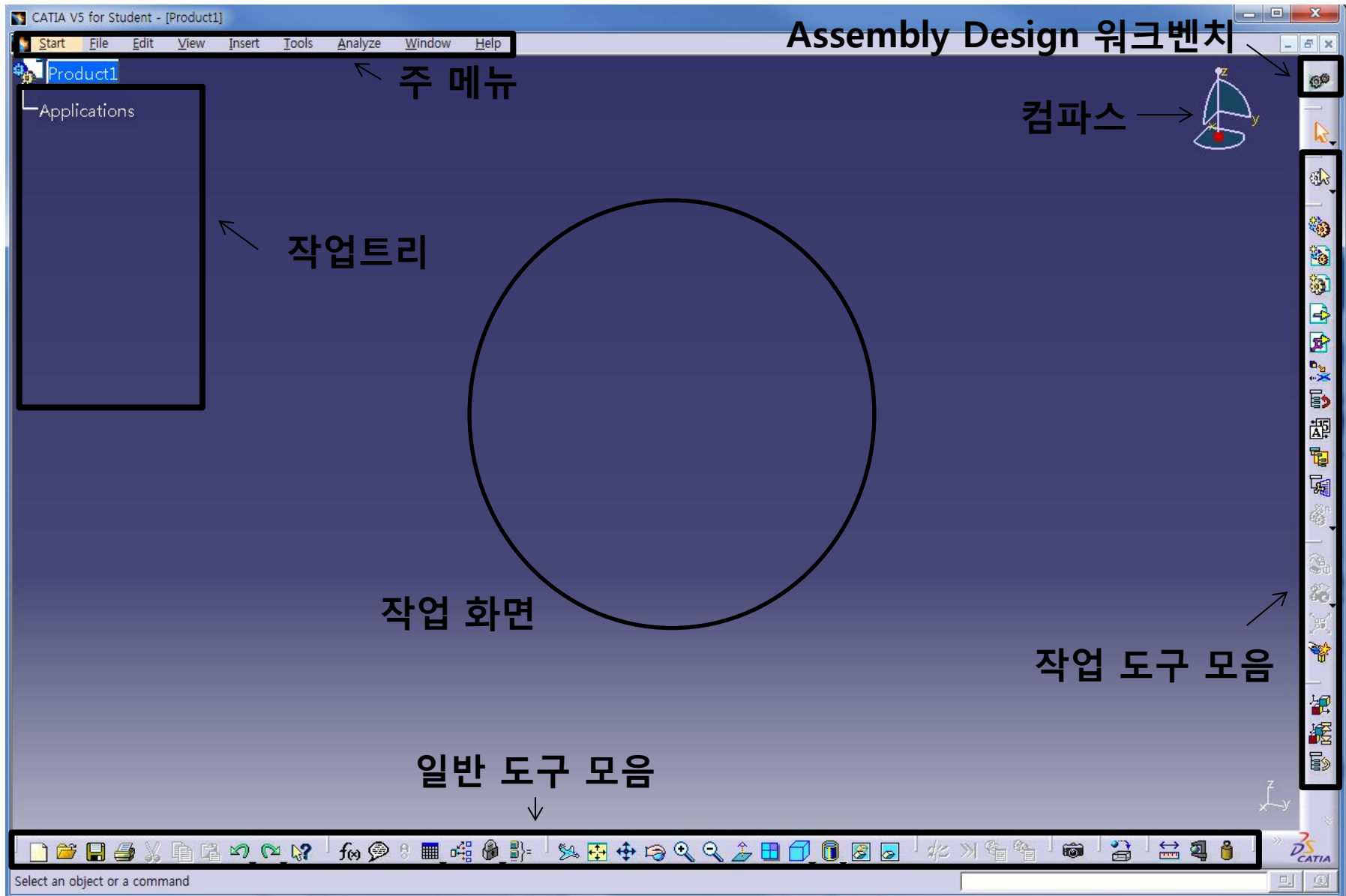
Start 메뉴에서 Mechanical Design → Assembly Design 선택



혹은, 카티아 실행화면에서 선택 (Start menu 설정시)



ASSEMBLY DESIGN 작업화면



ASSEMBLY DESIGN 툴바 종류



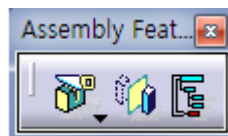
새로운 Part, Component, Product등을 만들거나 만들어진 Part, Component, Product 등을 불러들이는 툴바



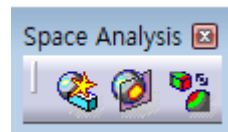
불러온 Part의 위치를 움직이게 할 수 있는 툴바



불러온 Part 간에 구속조건을 부여하는 툴바



Part Design의 몇 가지 툴바를 Assembly Design 내에서 사용할 수 있게 하는 툴바



Component간에 간섭을 확인하거나, 단면을 확인함.

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ASSEMBLY DESIGN TOOLS

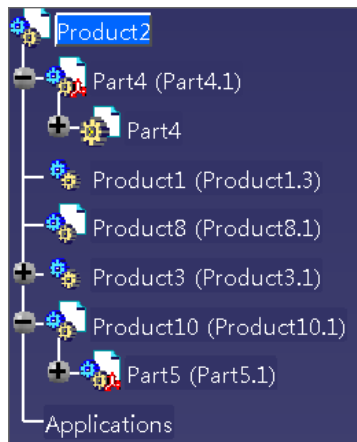
Product Structure Tools



Component, Product, Part



- 새로운 Component, Product, Part 생성



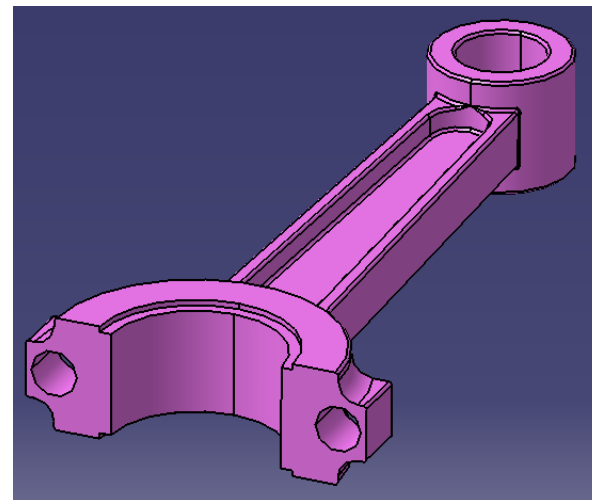
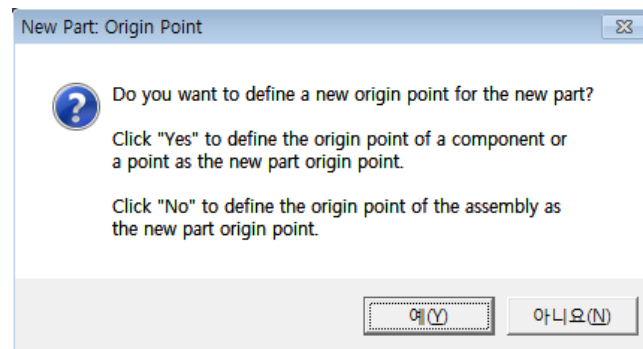
Existing Component



- 이미 있는 Component or Part를 Product에 추가



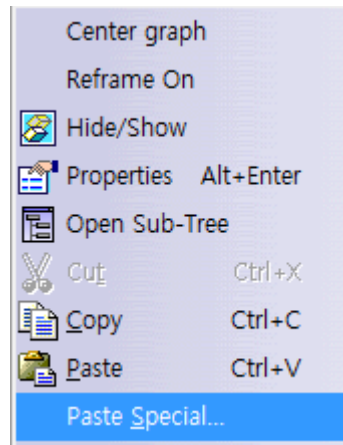
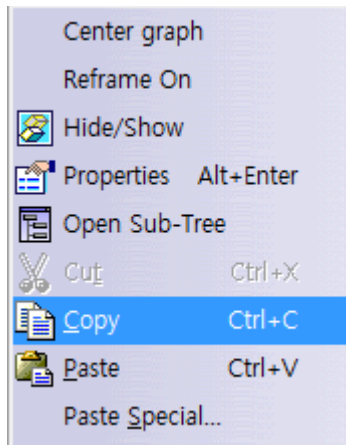
<Part 사용시>



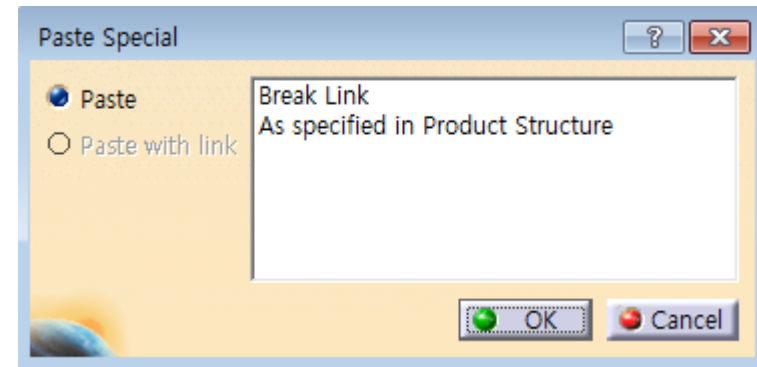
ASSEMBLY DESIGN TOOLS

Component 복사하기

- 원하는 Component 에 마우스 오른쪽 클릭을 하여 Copy 한 후 상위 목록에 Paste.
- Copy된 Component는 기존의 Component가 수정될 경우 같이 수정됨.
- Paste Special을 이용하여 Break Link를 사용할 경우 독립적으로 복사됨.



<Paste Special>



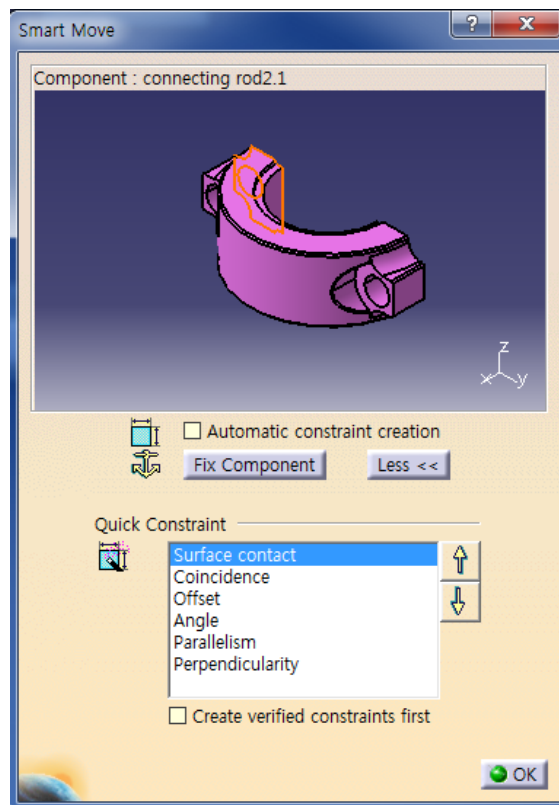
ASSEMBLY DESIGN TOOLS

Product Structure Tools

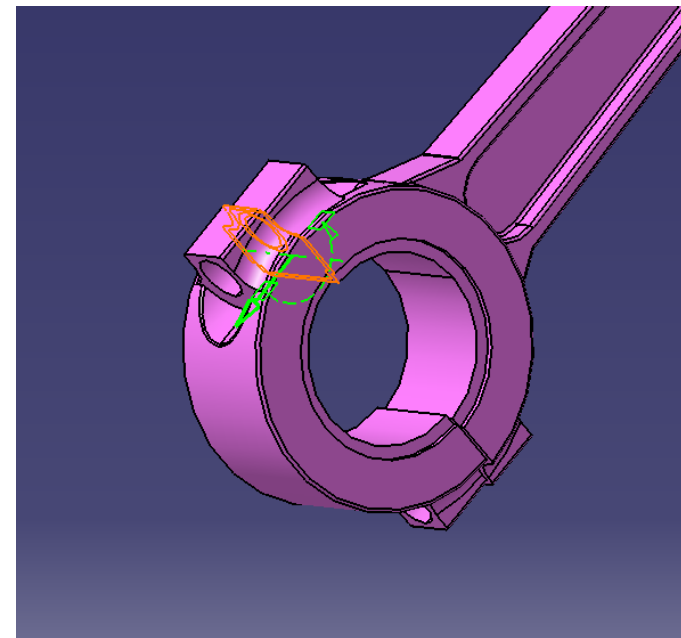


Existing Component With Positioning

- Component or Part를 Product에 추가 하면서 대략적인 위치, 구속도 결정.



<Surface contact>



ASSEMBLY DESIGN TOOLS



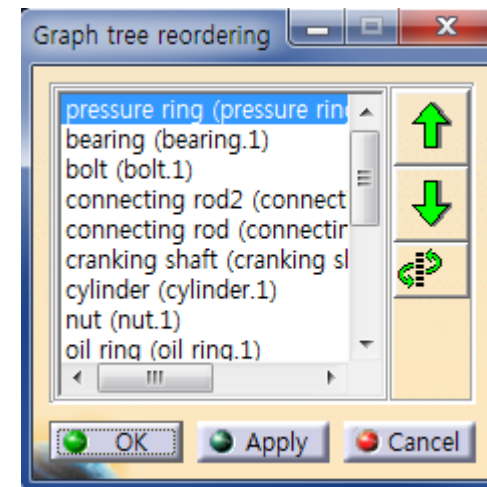
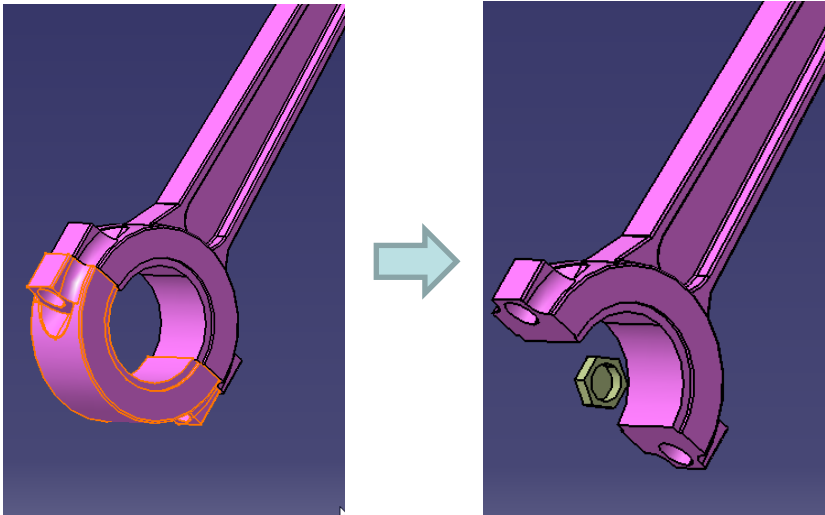
Product Structure Tools

Replace Component

- 선택한 Component를 새로운 Component로 대체

Replace Component

- 작업 트리의 순서를 변경



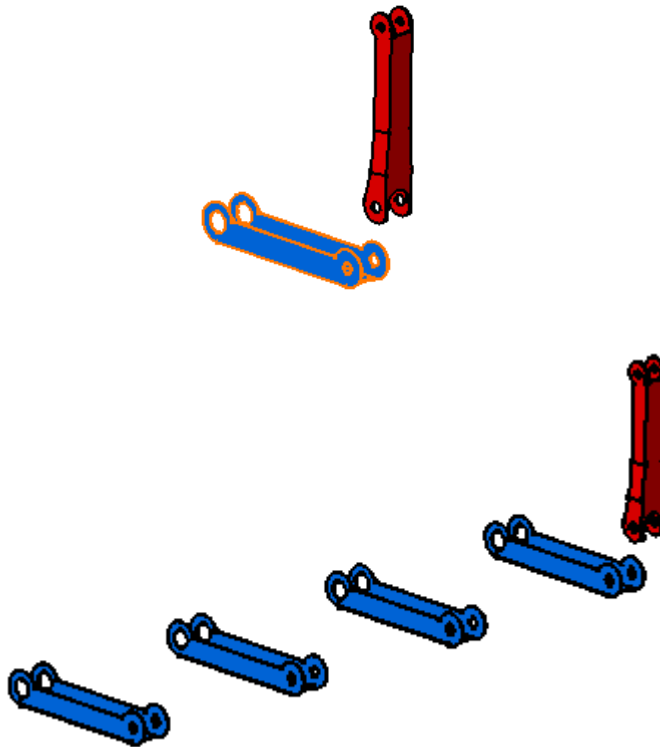
ASSEMBLY DESIGN TOOLS

Product Structure Tools



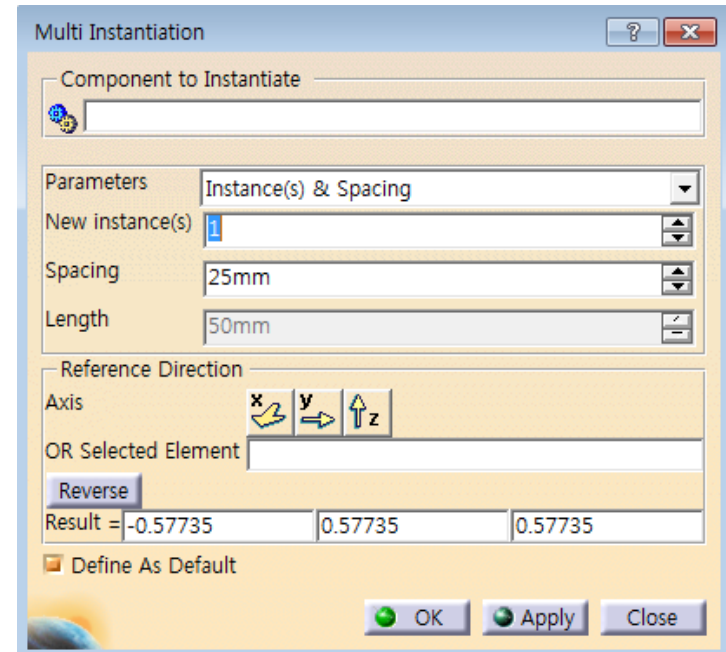
Fast Multi-Instantiation

- Component를 복사를 간편하게 해줌.



Define Multi-Instantiation

- Component 복사하는 방법 등을 정의함.



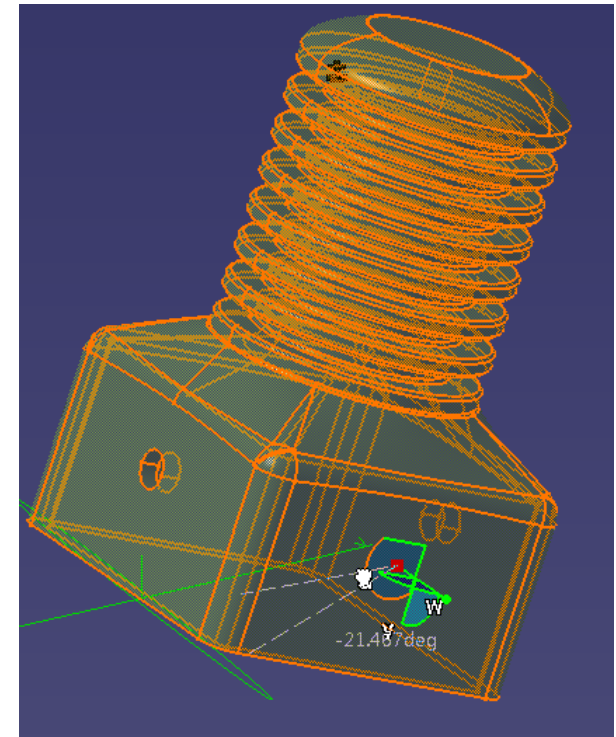
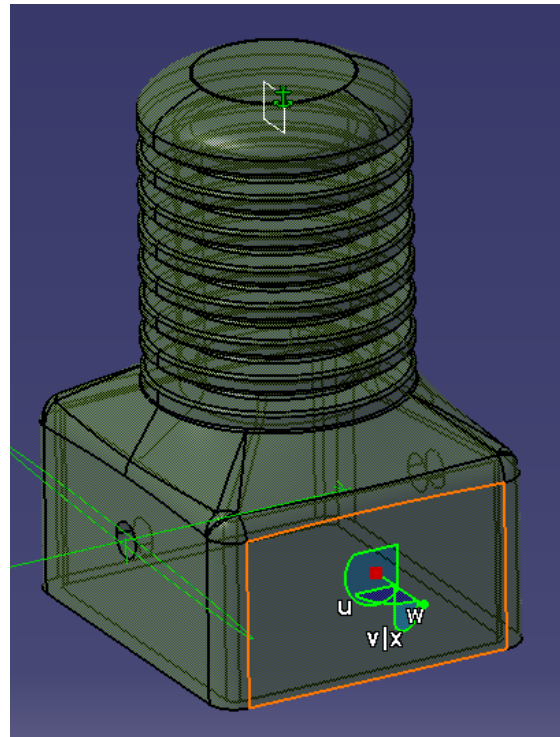
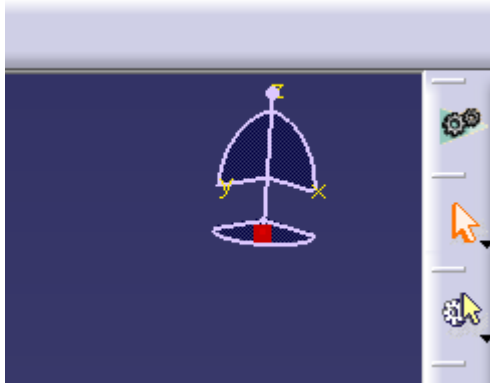
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COMPASS 사용하기

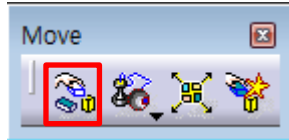
화면 오른쪽 상단의 Compass를 원하는 모델에 드래그

- Part Design에서 사용법과 같으나, Assembly Design의 경우 업데이트 하면 구속한 위치로 이동함.



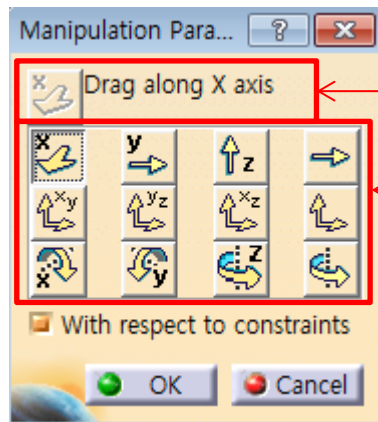
ASSEMBLY DESIGN TOOLS

Move



Manipulation 

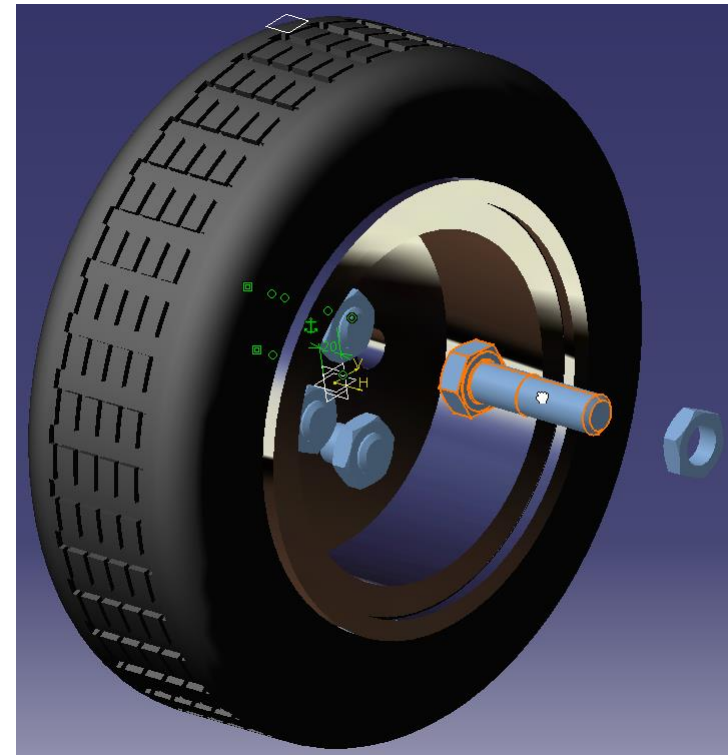
- 선택한 방법으로 선택한 component를 이동 가능하게 함



선택한 이동방법에 대한 설명

이동방법 선택

<Drag along X axis>



ASSEMBLY DESIGN TOOLS

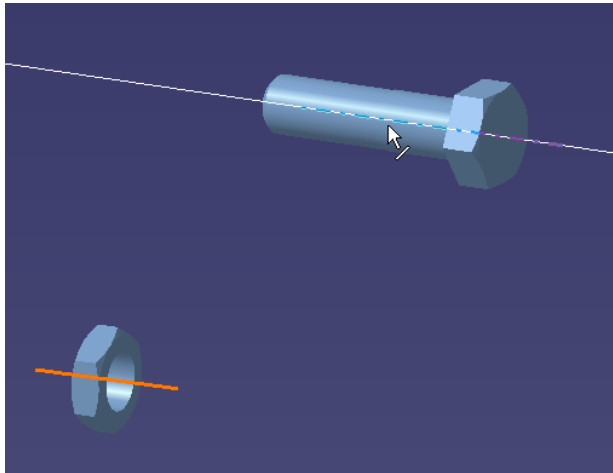
Move



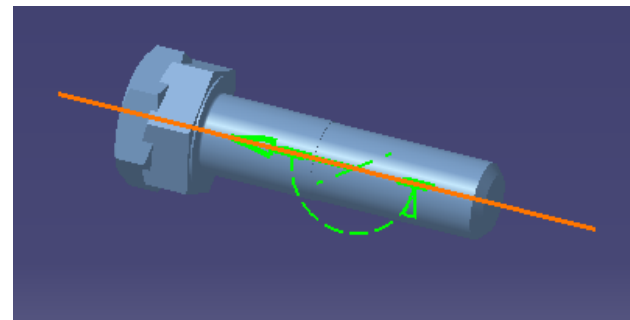
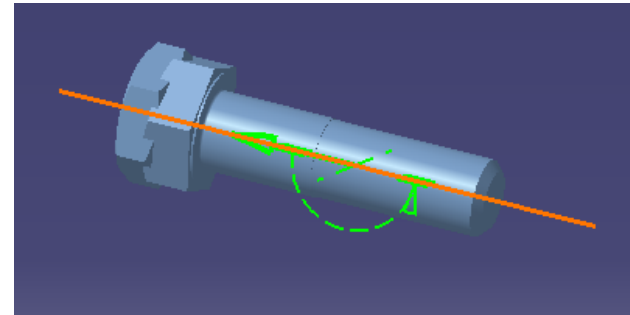
Snap 

- 구속조건을 이용하여 이동을 보다 간편하게 해줌 (실제로 구속되지는 않음)

<constraint와 유사하게 선택>



<방향 선택 가능>



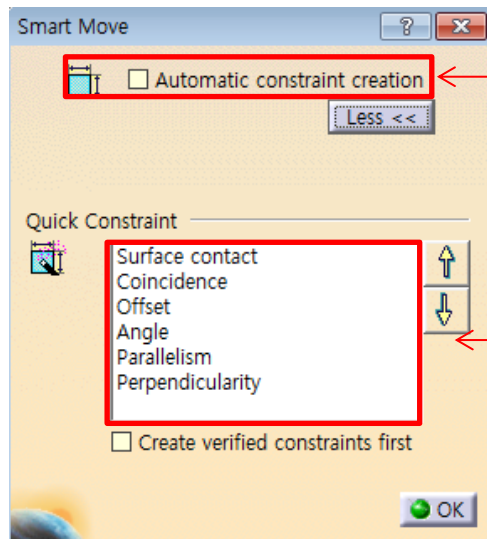
ASSEMBLY DESIGN TOOLS

Move



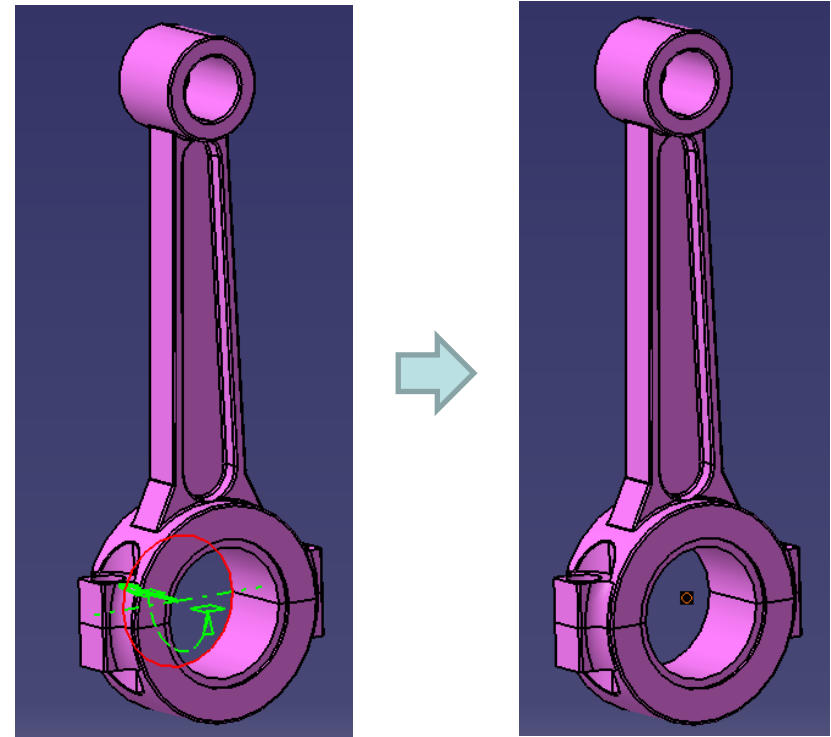
Smart Move 

- Manipulation + Snap + Constraint



자동으로 구속을 부여할 것인지 선택

구속조건 우선순위 변경



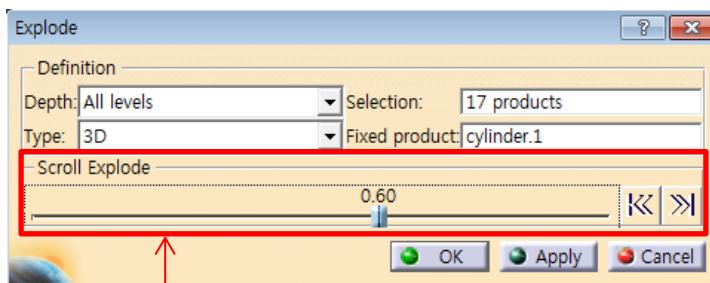
ASSEMBLY DESIGN TOOLS

Move

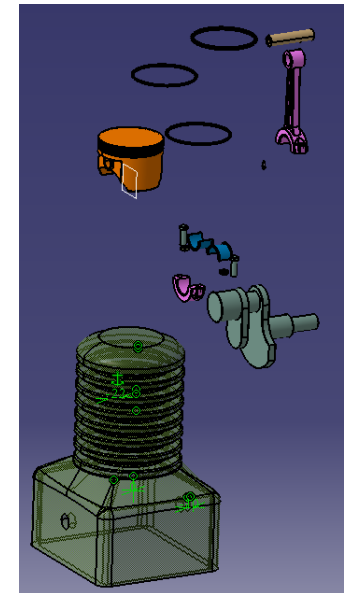
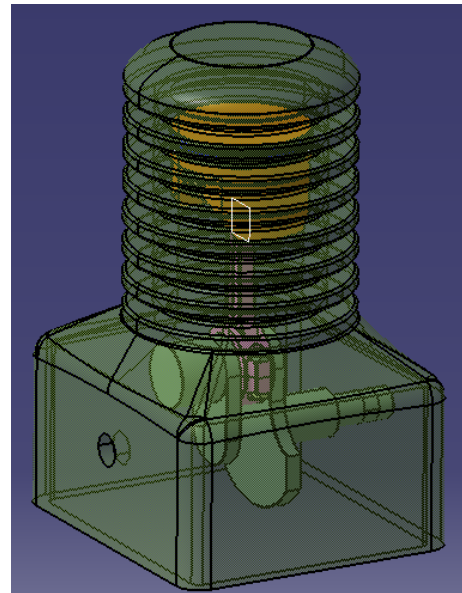


Explode 

- 조립되어있는(몽쳐있는) 모델을 분산시킴 (구속되어 있지 않는 경우 update시 원상복구가 안됨)



분산 정도를 조절



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ASSEMBLY DESIGN TOOLS

Constraints



Coincidence : Component 간의 축을 일치시킴

Contact : Component간의 면을 일치시킴

Offset : Component의 요소 사이에 Offset을 부여함

Angle : Component의 요소 사이에 Angle을 부여함

Fix : 선택한 Component를 고정시킴

Fix Together : 선택한 Component들을 함께 움직이도록 함

Quick Constraint : 위의 Constraint들을 자동으로 선택해서 부여함

Flexible/Rigid Sub-Assembly : 복사한 component 사이의 종속/독립 관계를 설정

Change Constraint : 존재하는 constraint를 다른 constraint로 변경함

Reuse Pattern : Part Design의 Pattern기능을 이용하여 component를 복사함

ASSEMBLY DESIGN TOOLS

Constraints

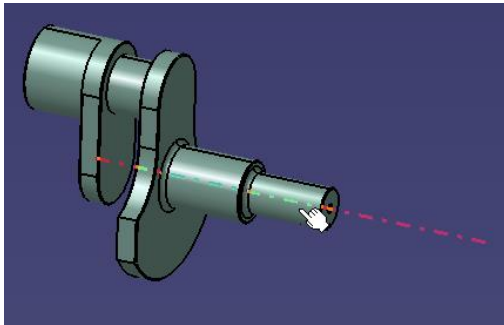


Coincidence Constraint

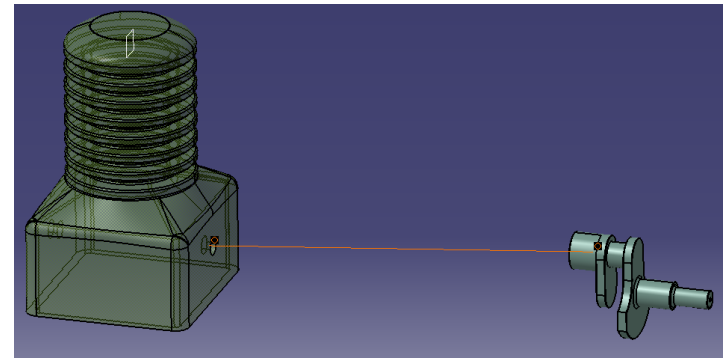
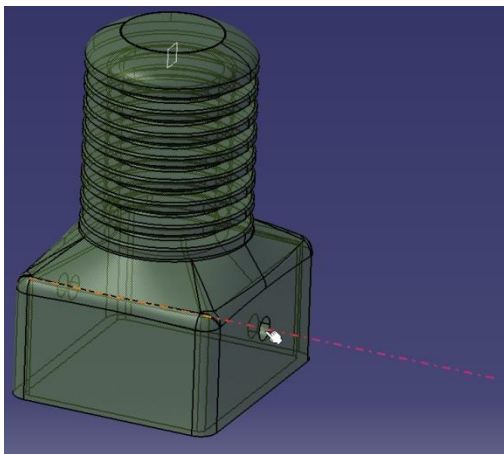
- Component의 중심선을 선택하여 일치시키도록 함

<중심선 선택>

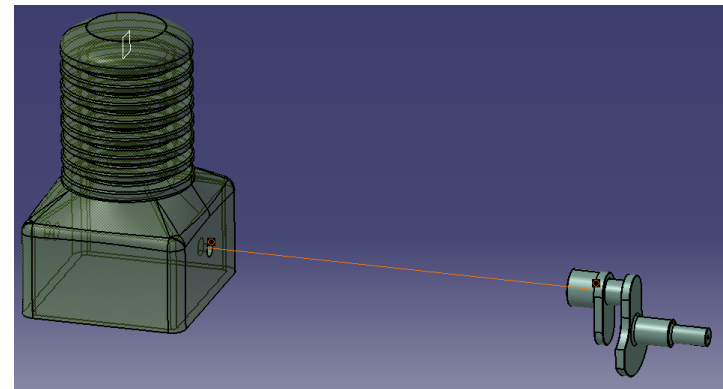
Crank
shaft



Cylinder



update



ASSEMBLY DESIGN TOOLS

Constraints

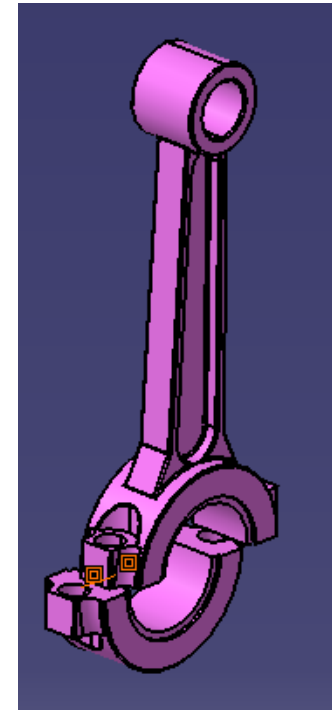
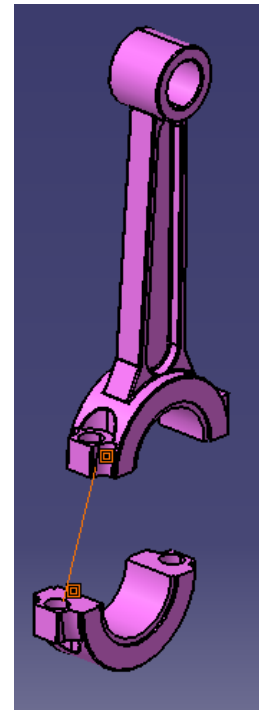
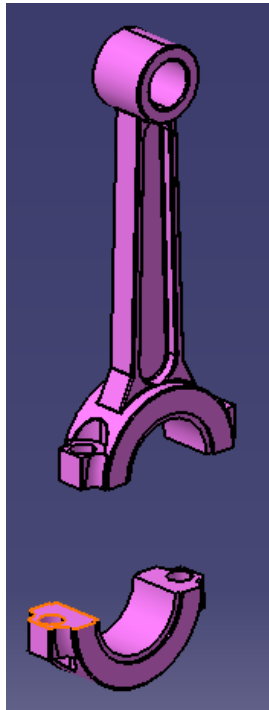


Contact Constraint



- 선택한 Component의 면들을 동일 plane 상에 위치하도록 함

<접촉할 면 선택>



ASSEMBLY DESIGN TOOLS

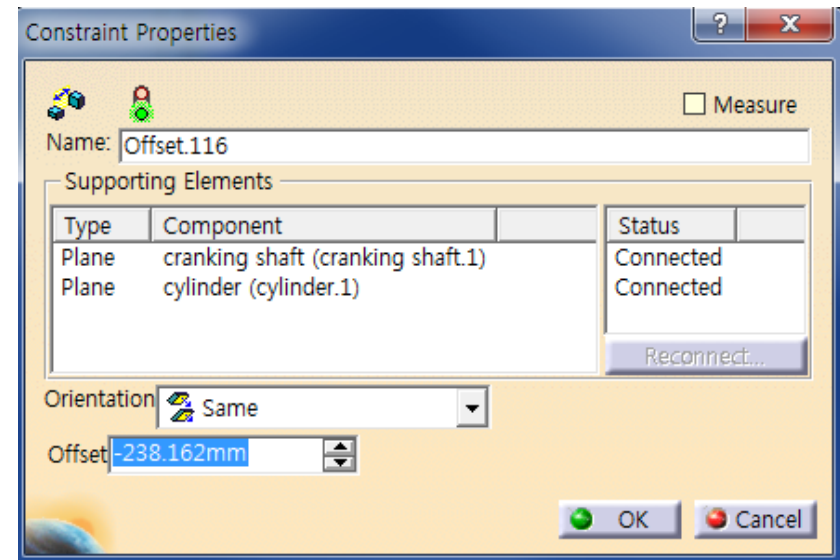
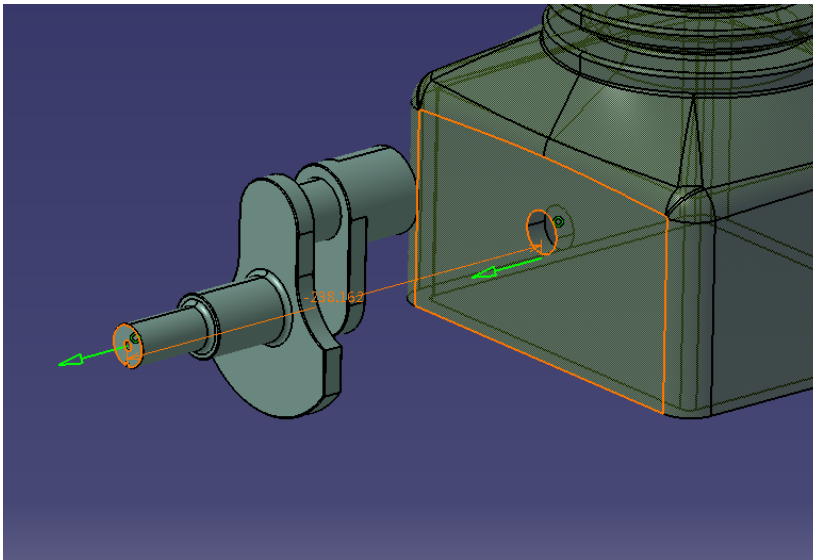
Constraints



Offset Constraint

- 선택한 요소들이 특정 거리를 갖도록 구속

<구속할 면 선택>



ASSEMBLY DESIGN TOOLS

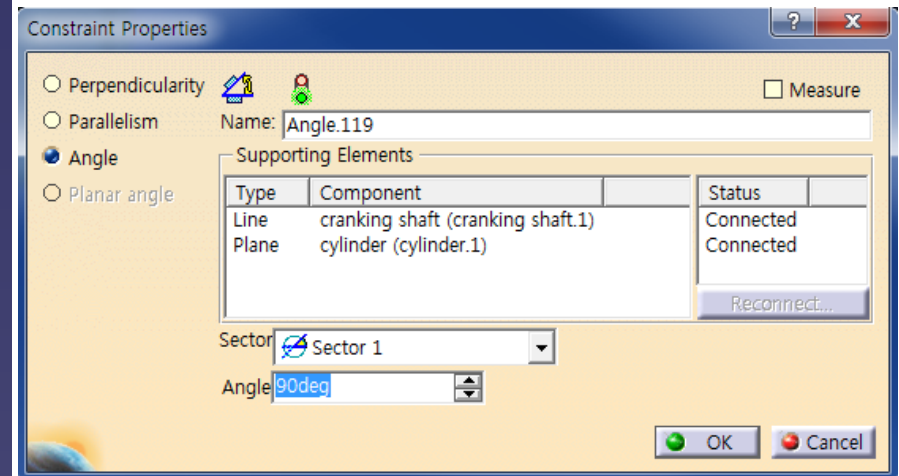
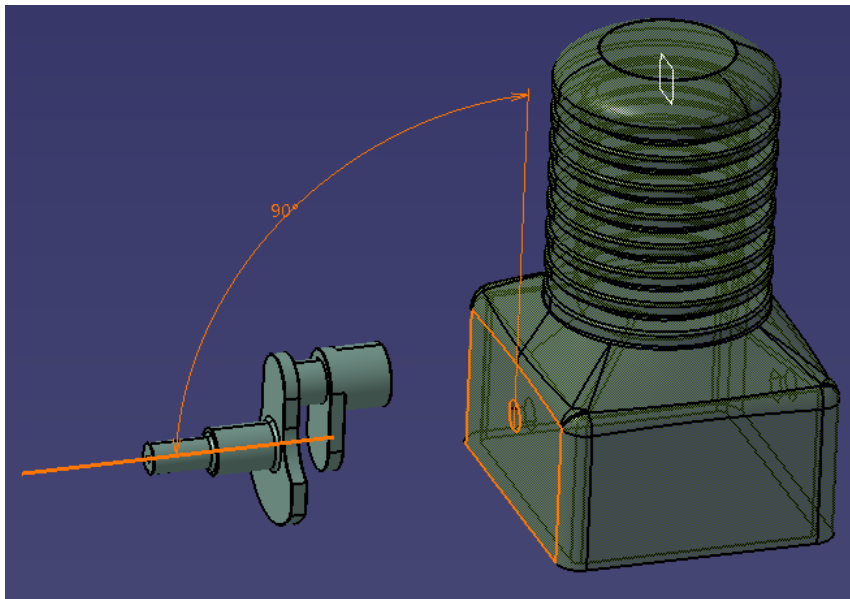
Constraints



Angle Constraint

- 선택한 요소 사이에 각도를 부여하여 구속

<구속할 요소 선택>



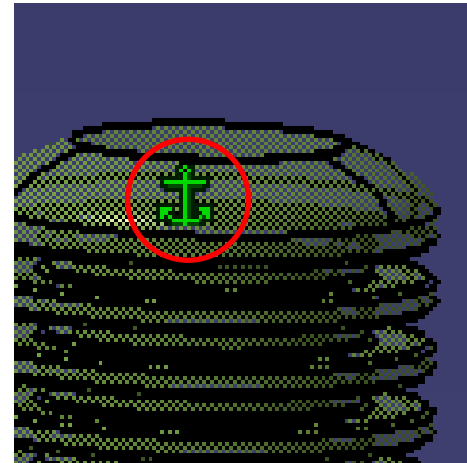
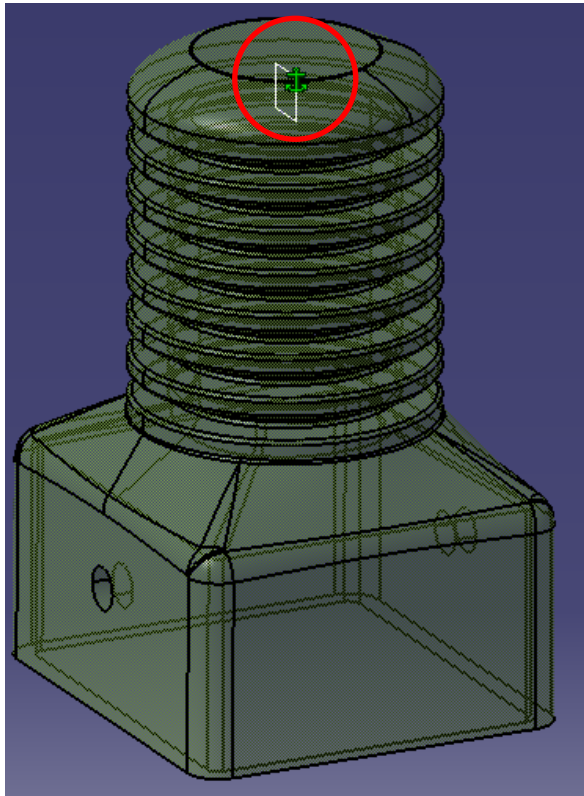
ASSEMBLY DESIGN TOOLS

Constraints



Fix Component 

- 현재 위치하고 있는 자리에 구속



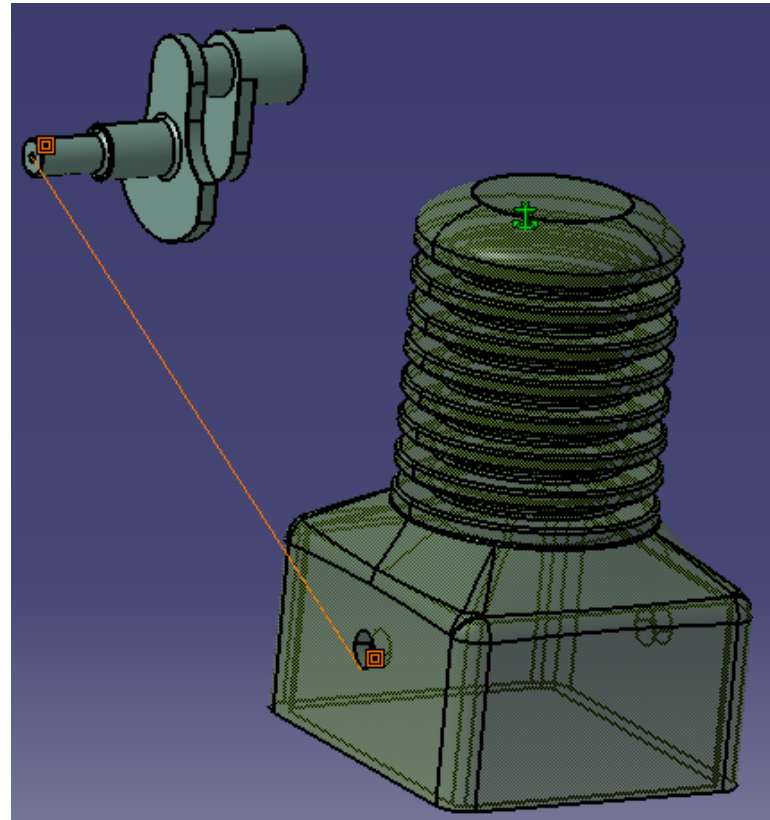
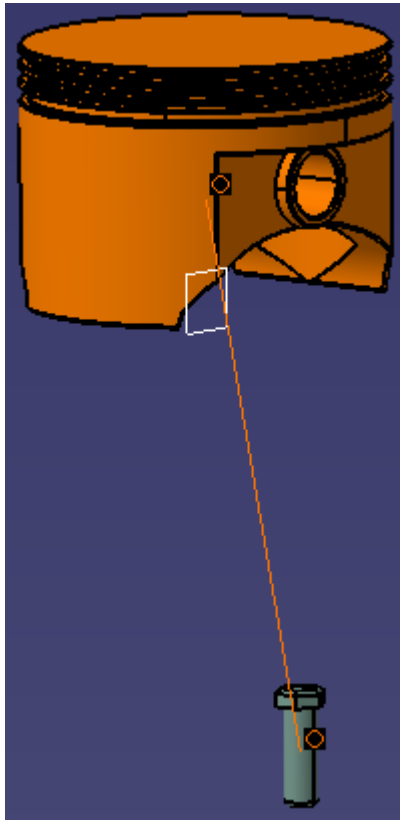
ASSEMBLY DESIGN TOOLS

Constraints



Quick Constraint 

- Constraint 종류를 자동으로 결정해줌



ASSEMBLY DESIGN TOOLS

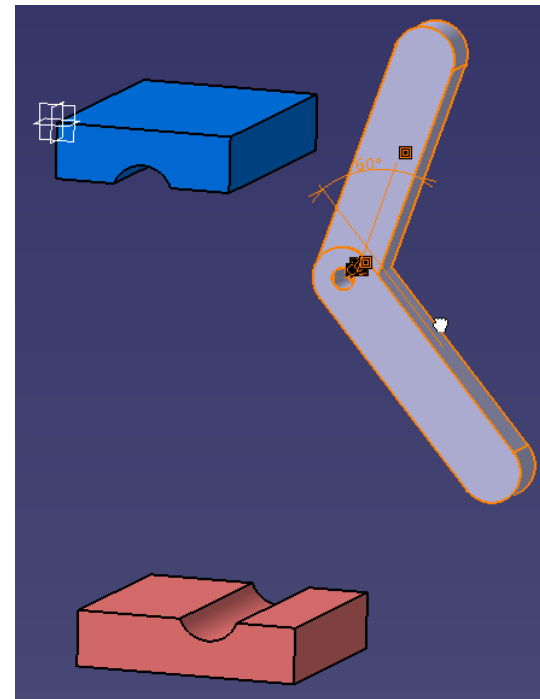
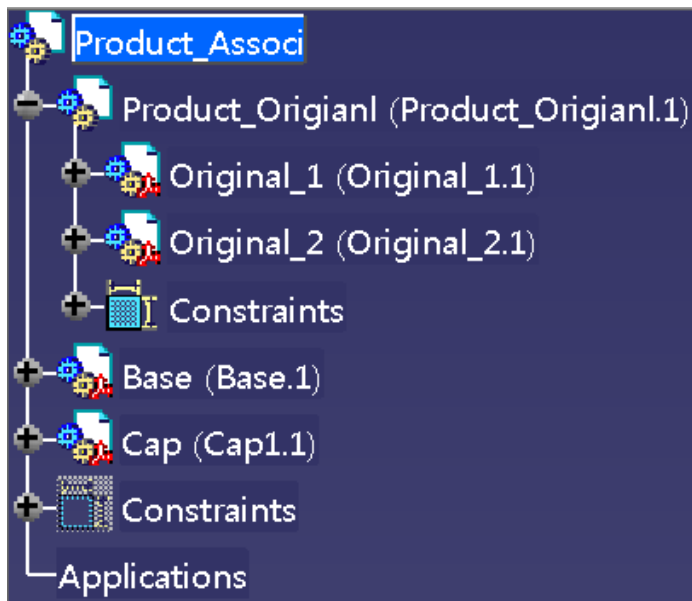
Constraints



Flexible-Rigid Sub-Assembly

- 그림과 같이 Product_Associ 를 활성화 시킬 경우 Product_Original 안의 2개의 component는 동시에 움직이게 된다.

<기본 트리>



ASSEMBLY DESIGN TOOLS

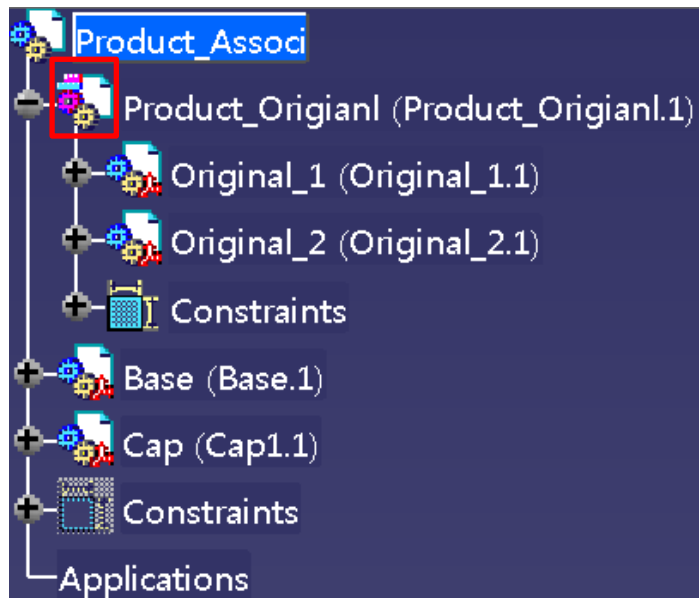
Constraints



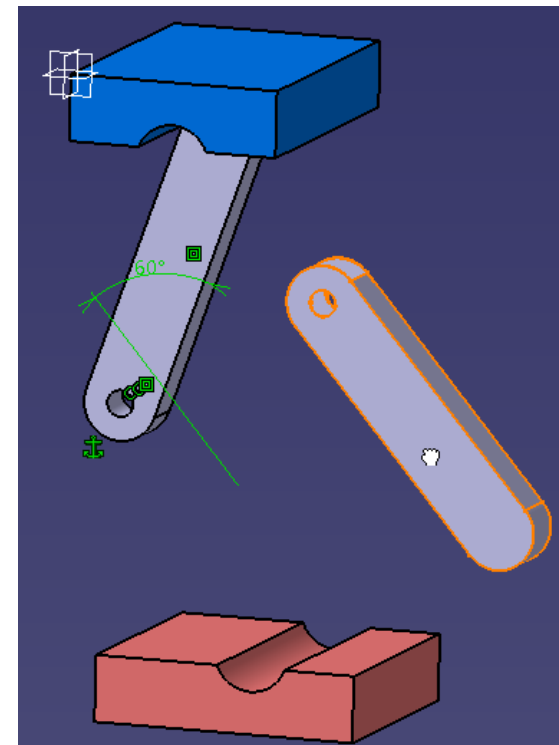
Flexible-Rigid Sub-Assembly

- Sub-Assembly를 이용하게 상하 관계가 사라짐(혹은 다시 생성)

<Flexible-Rigid Sub-Assembly 적용>



<선택된 component만 독립적으로 이동>



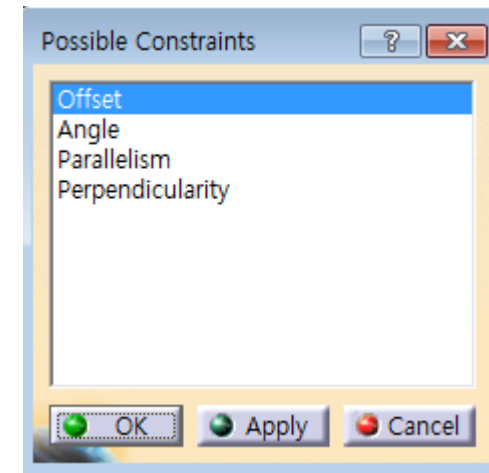
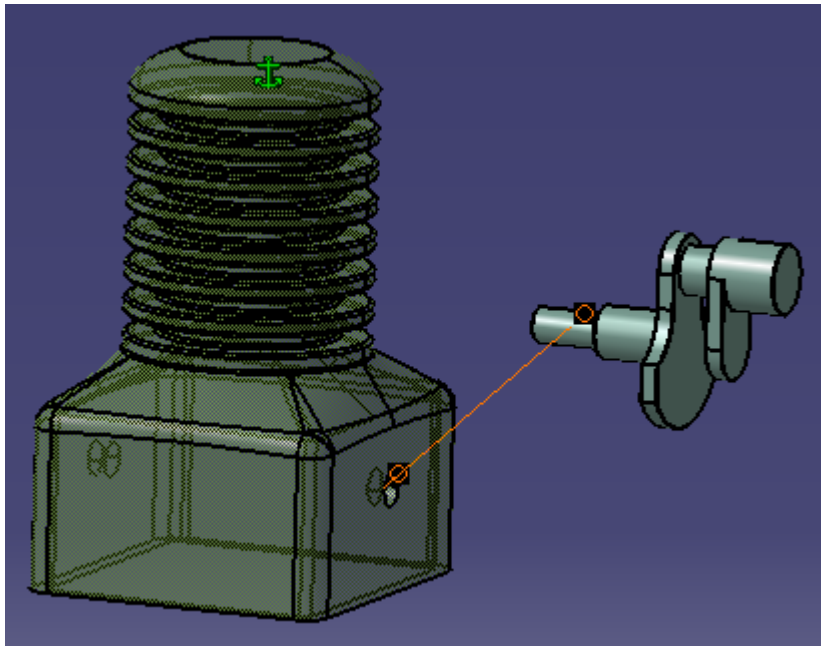
ASSEMBLY DESIGN TOOLS

Constraints



Change Constraint 

- 생성한 constraint를 변경함 (변경 가능한 List 생성)



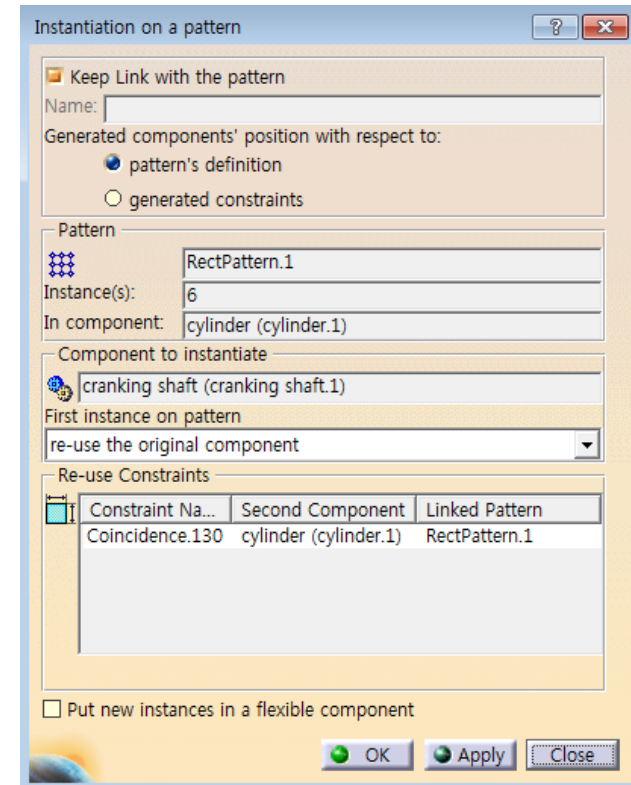
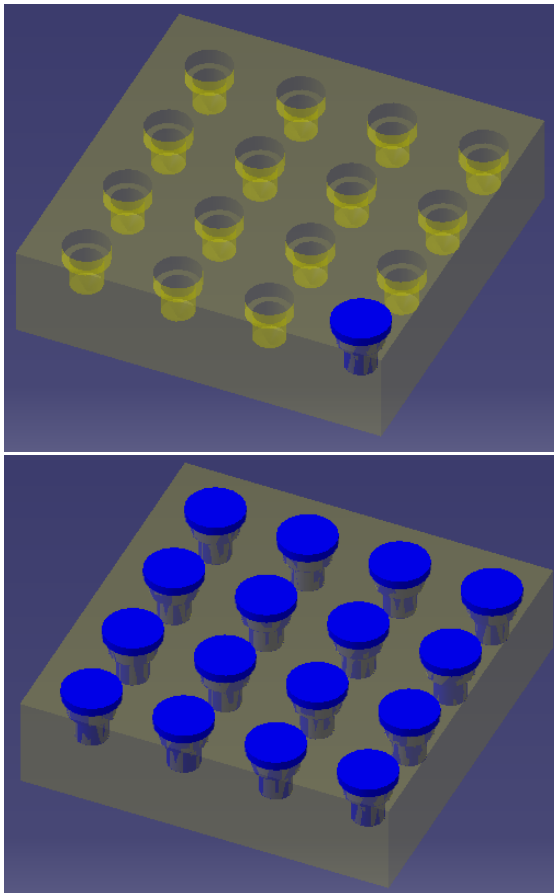
ASSEMBLY DESIGN TOOLS

Constraints



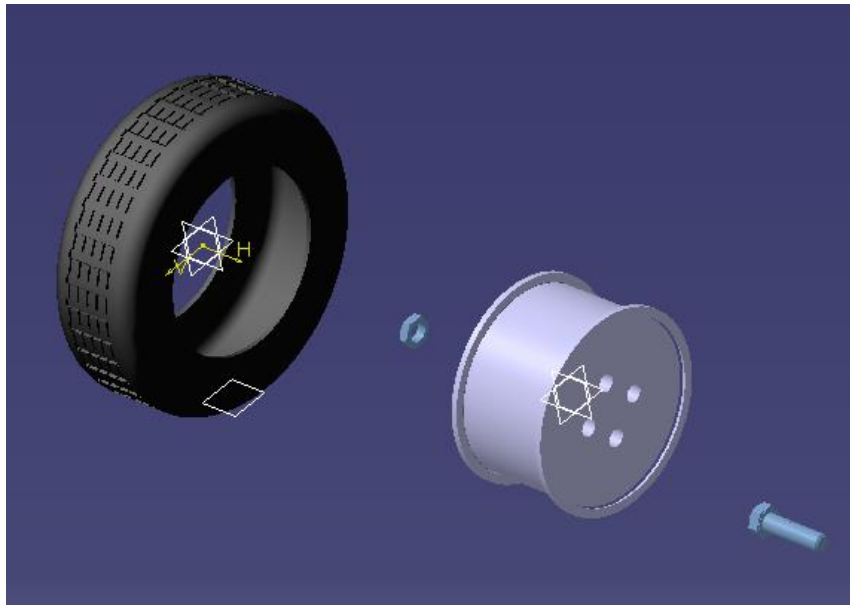
Reuse Pattern

- 기존에 생성된 Pattern을 이용해 constraint로 연결된 component를 복사함



실습 예제

홈페이지의 Car_Wheel 파일을 이용하여 오른쪽 그림과 같이 Assembly Design 작업을 진행
(Assembly Design 작업 후 Explode 하여 다시 Update 했을 때 조립되어야 함)

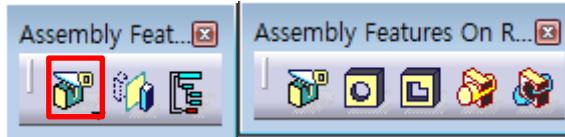


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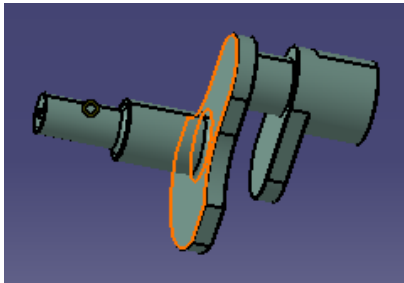
Assembly Features



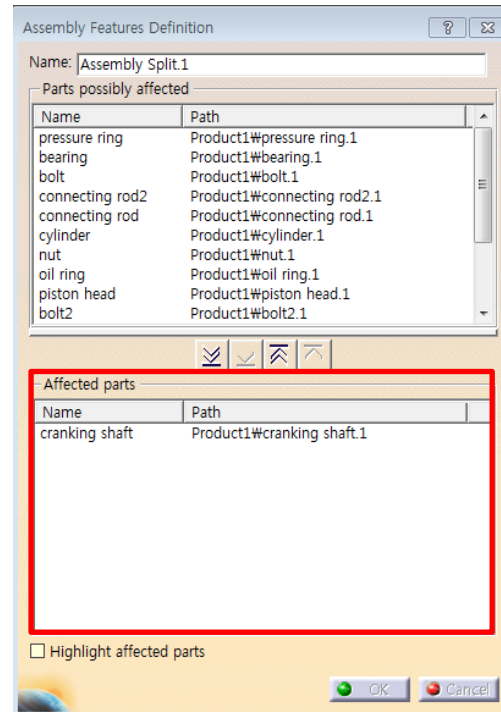
Assembly Split

- 선택한 면을 기준으로 component를 분할함

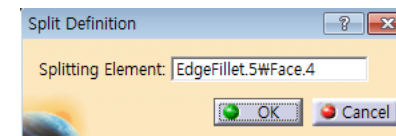
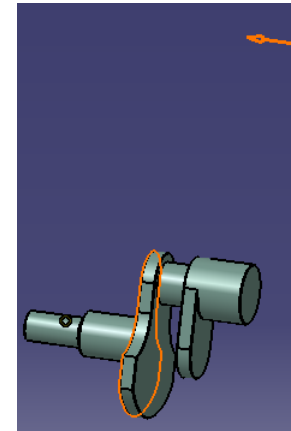
<임의의 part 선택>



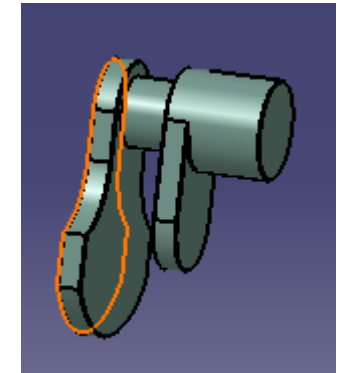
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<기준면 선택>



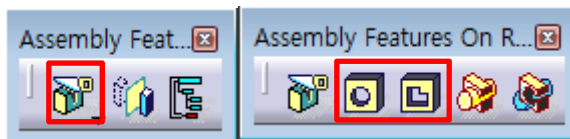
<기준면 선택>



화살표 방향의 부분
만 남게됨

ASSEMBLY DESIGN TOOLS

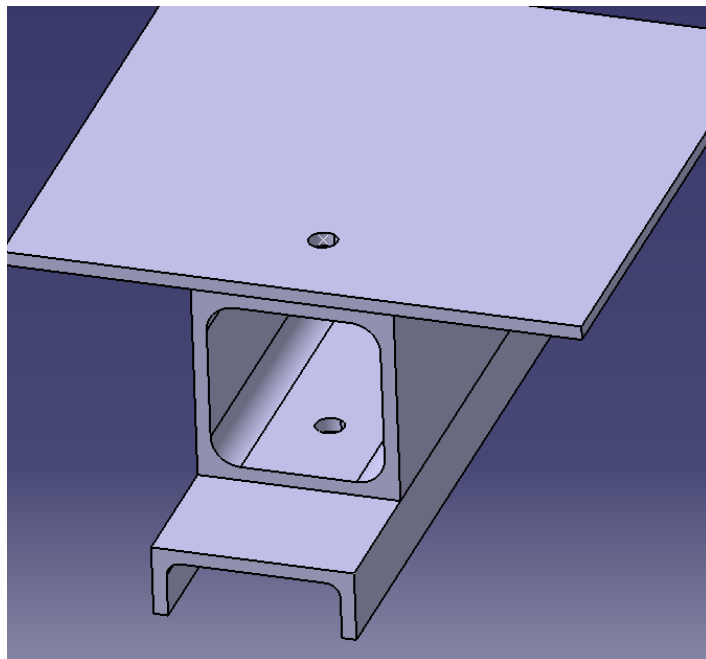
Assembly Features



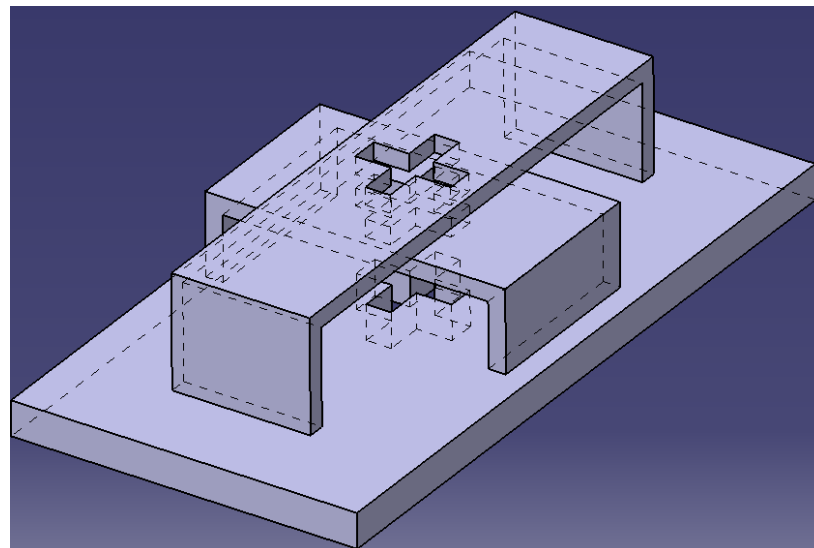
Assembly Hole/ Pocket

- 선택한 component에 대해 Hole/Pocket 진행 (여러 part에 동시에 생성 가능)

<Hole>

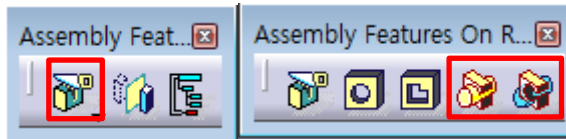


<Pocket>



ASSEMBLY DESIGN TOOLS

Assembly Features

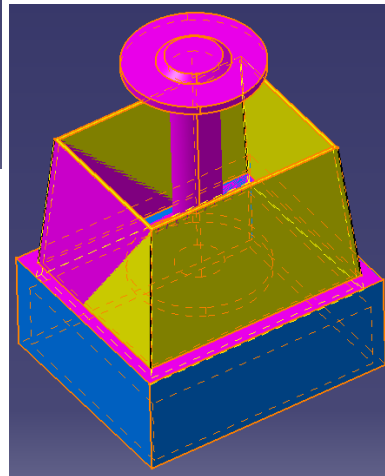
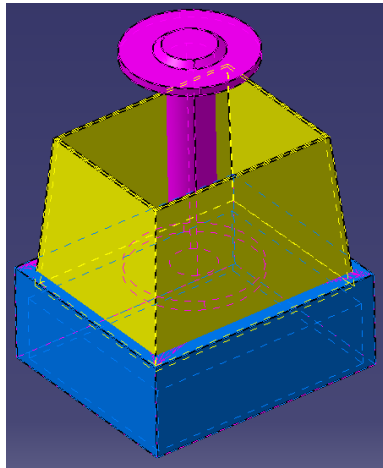


Assembly Add/ Remove

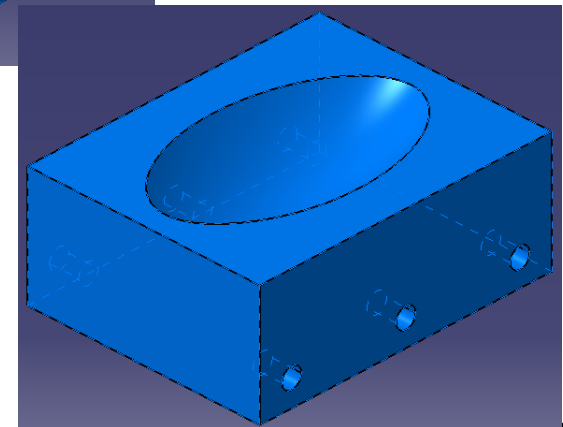
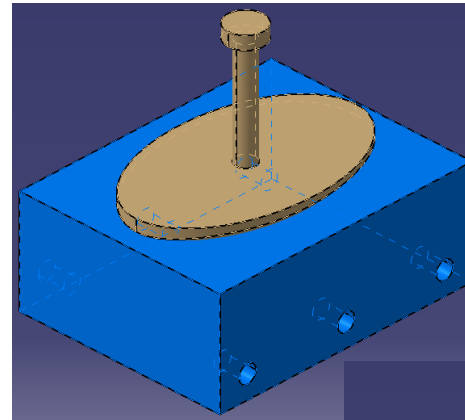


- 선택한 component 간의 Add/Remove 진행

<Add>

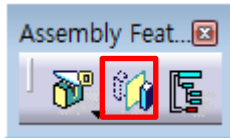


<Remove>



ASSEMBLY DESIGN TOOLS

Assembly Features

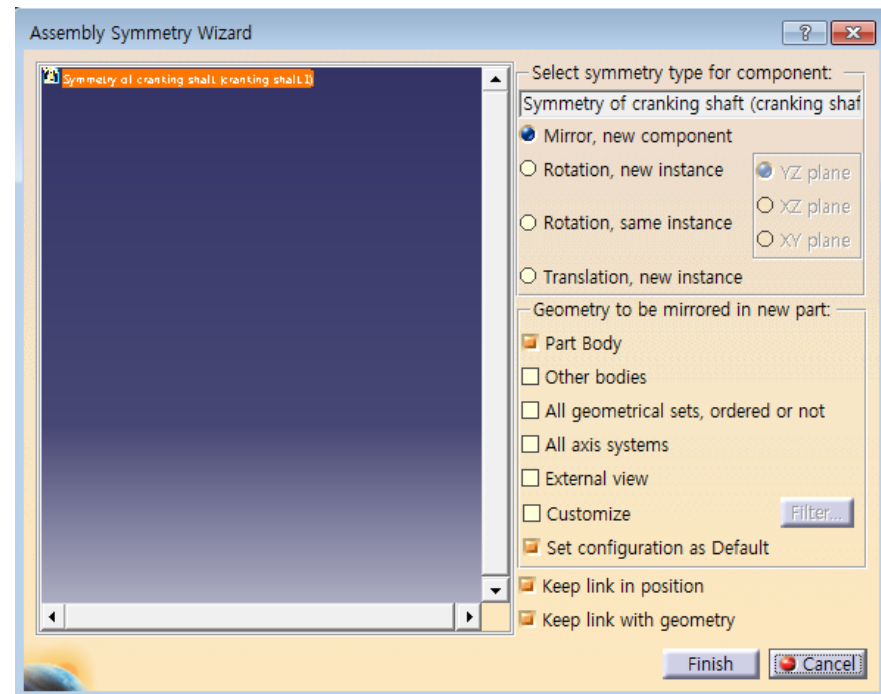
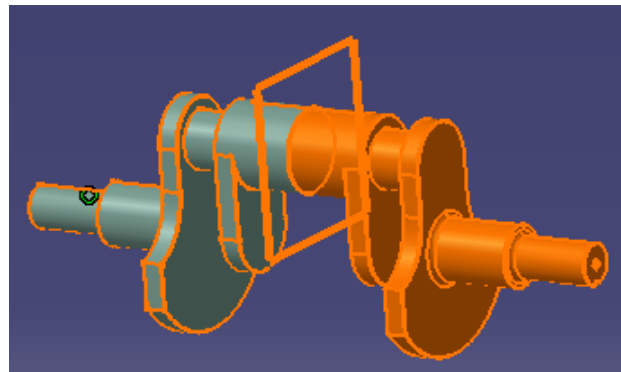
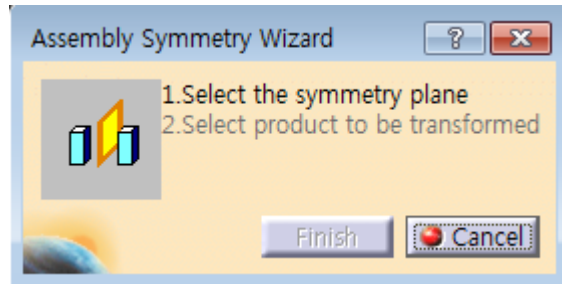


Assembly Symmetry



- Component 대칭 복사

<세부 설정>

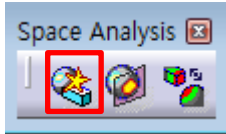


CONTENTS

- ✓ 시작하기
- ✓ Product Structure Tools
- ✓ Move
- ✓ Constraints
- ✓ Assembly Features Toolbar
- ✓ **Space Analysis**

ASSEMBLY DESIGN TOOLS

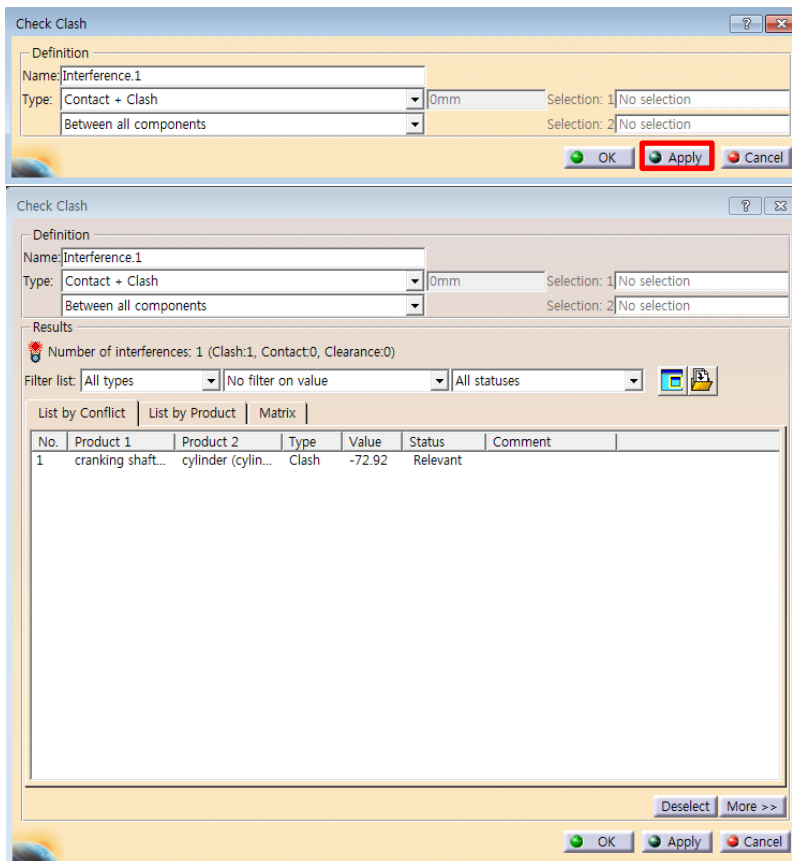
Space Analysis



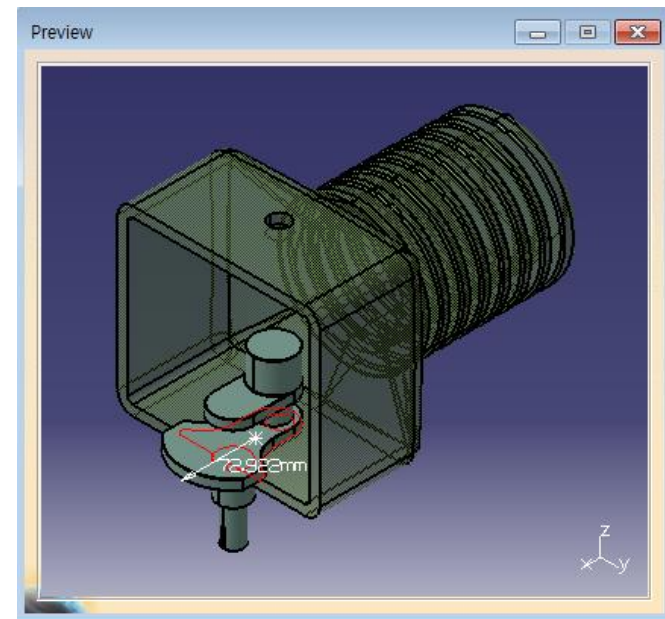
Clash



- Assembly를 구성하는 component 사이의 간섭을 확인

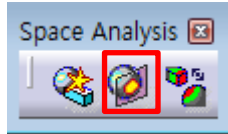


<Preview>



ASSEMBLY DESIGN TOOLS

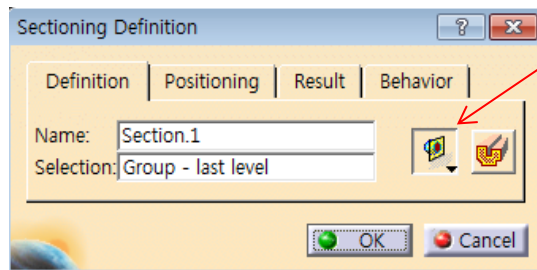
Space Analysis



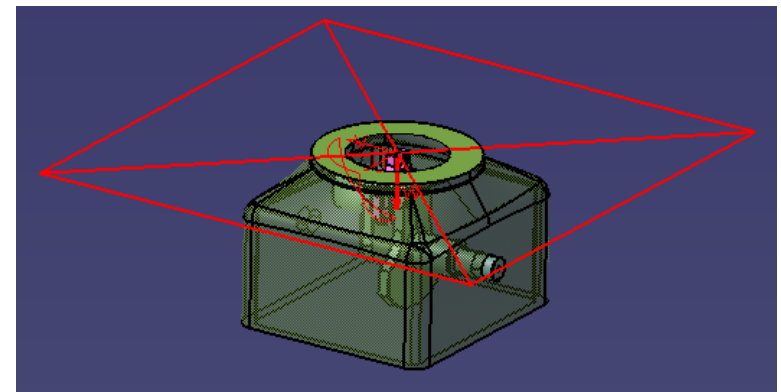
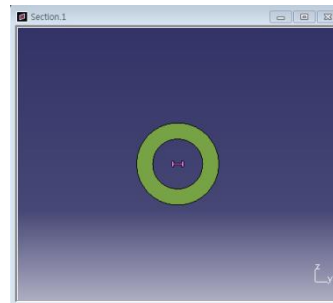
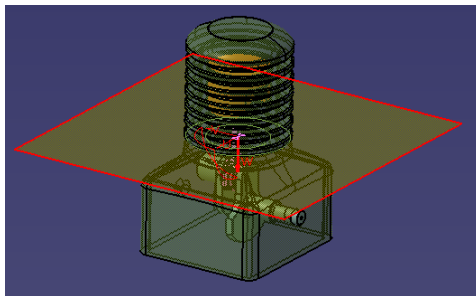
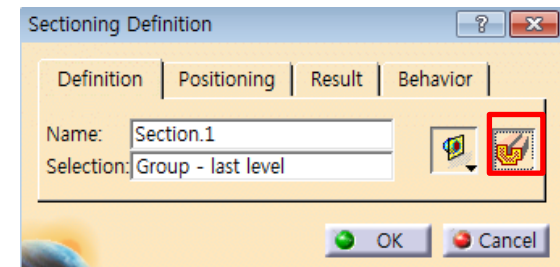
Sectioning



- Component의 단면을 확인

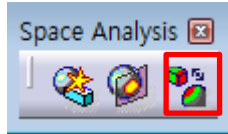


<Volume Cut>



ASSEMBLY DESIGN TOOLS

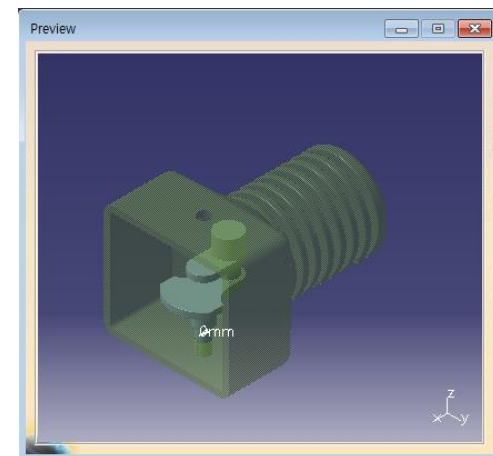
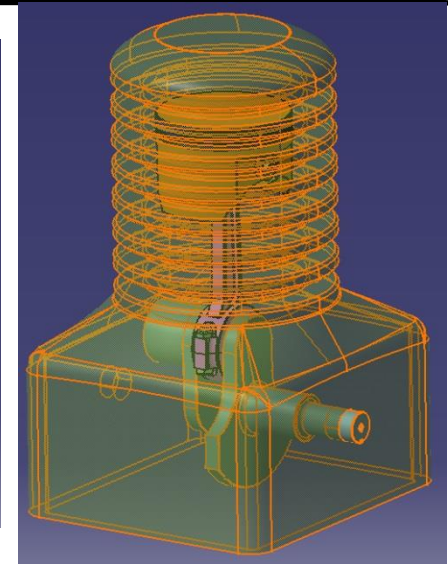
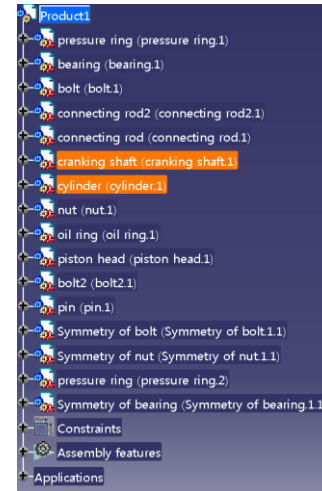
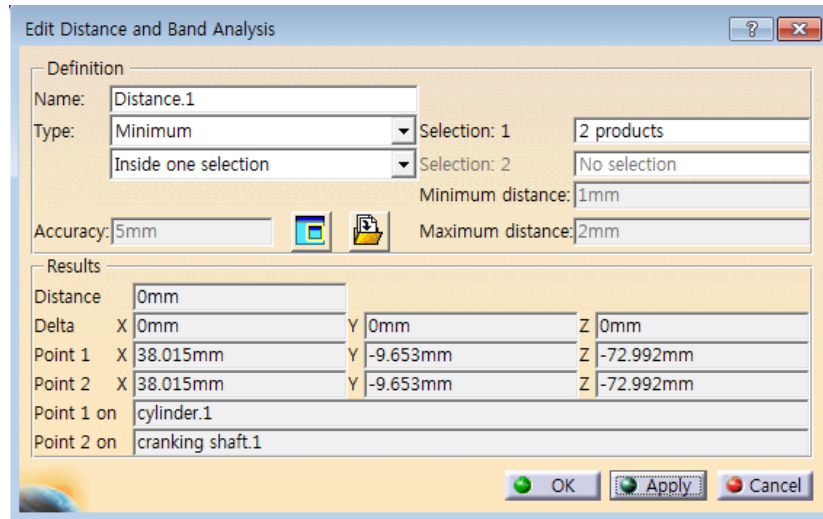
Space Analysis



Distance and Band Analysis



- Component간의 거리를 측정



실습 과제

홈페이지의 HW_Model 파일을 이용하여 오른쪽 그림과 같이 Assembly Design 작업을 진행
(Assembly Design 작업 후 Explode 하여 Update 했을 때 조립되어야 함 - Product + Part 파일들 압축하여 업로드)

