

P&ID부터 3D 기계 설계와 클라우드 협업까지 한번에!

SCK Autodesk 설계 혁신 웨비나



이경미 부장 SCK

- SCK Autodesk AEC 엔지니어
- 前 포스코 엔지니어링 화공
BIM Manager

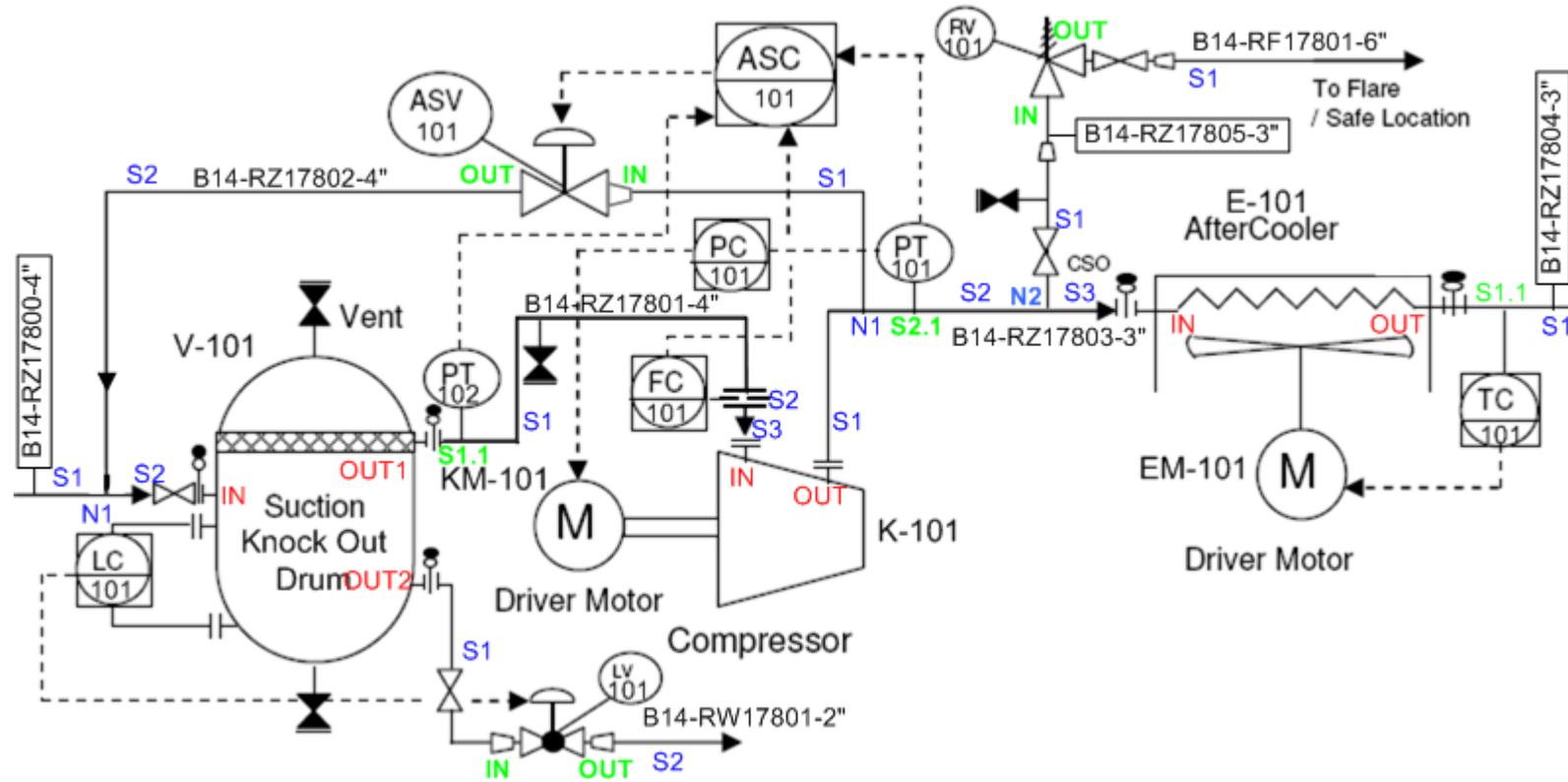


이승열 차장 SCK

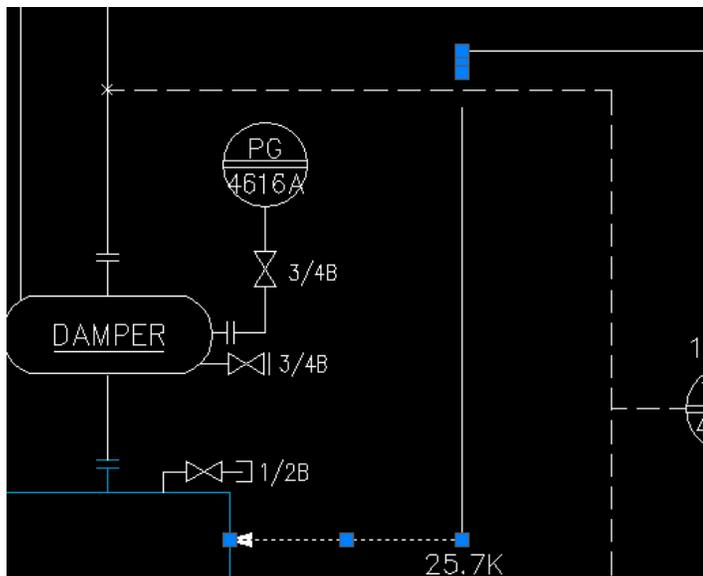
- SCK Autodesk D&M 엔지니어



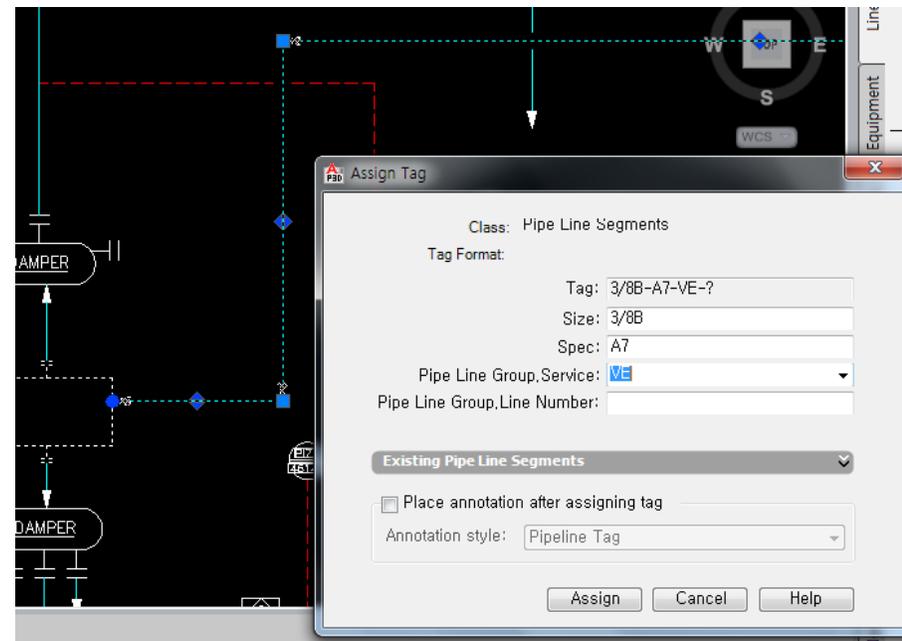
P&ID (Piping and Instrumentation Diagram)



CAD P&ID vs Intelligent P&ID | 배관 라인의 비교

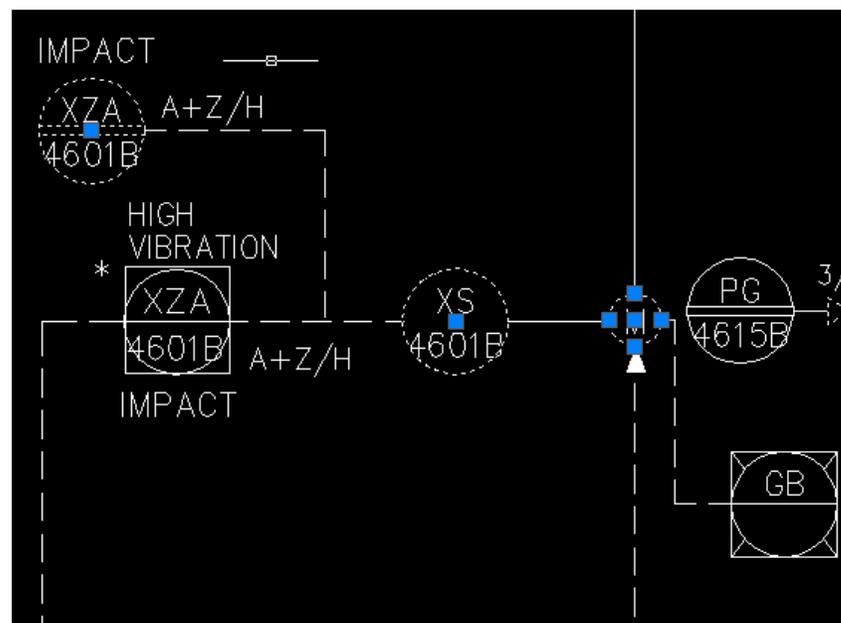


CAD P&ID

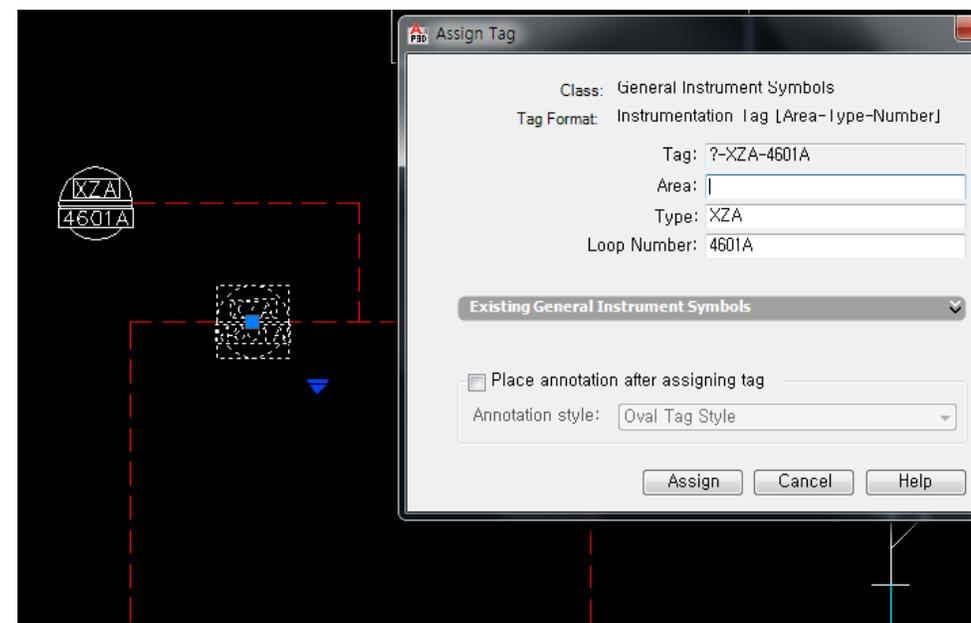


Intelligent P&ID

CAD P&ID vs Intelligent P&ID | 계장 심볼의 비교

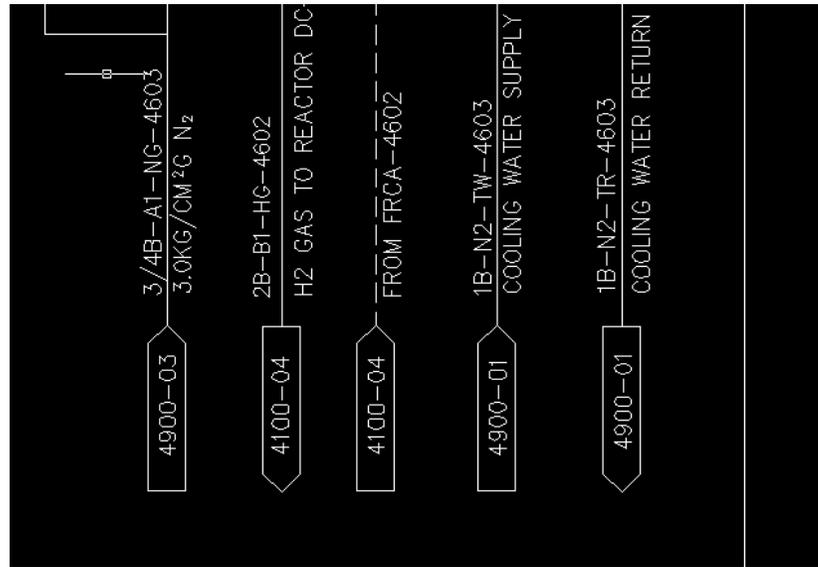


CAD P&ID

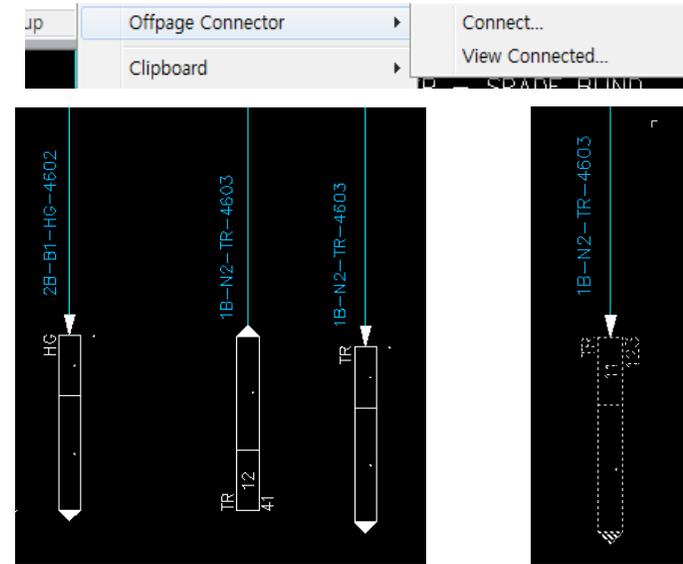


Intelligent P&ID

CAD P&ID vs Intelligent P&ID | OPC 비교 (Off-Page Connector)



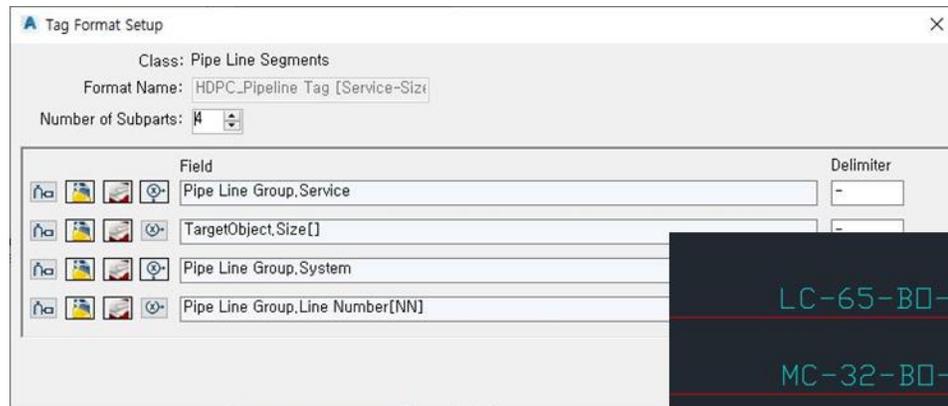
CAD P&ID



Intelligent P&ID

왜 AutoCAD Plant 이어야 할까?

고유 객체 Tag 지정을 통한 객체관리 실현



LC-65-B0-01

MC-32-B0-01

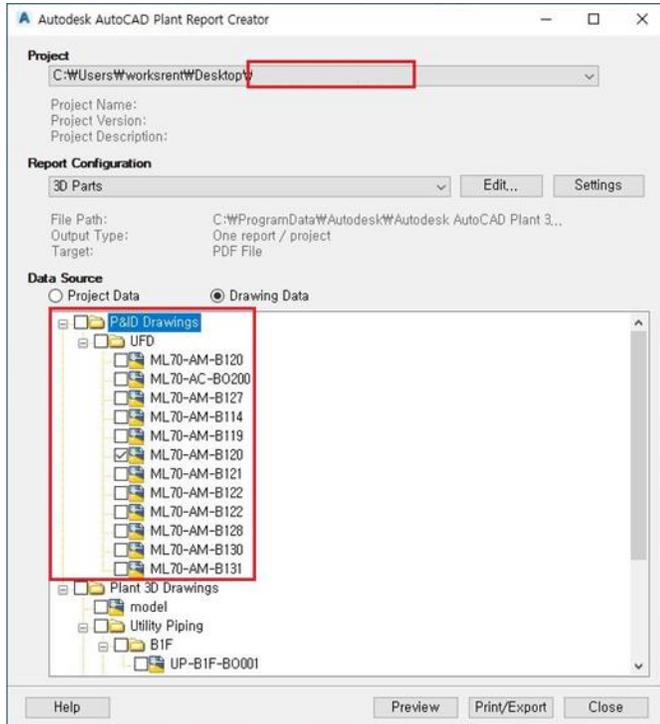
HC-50-B0-01

LC-25-B0-02

LC-25-B0-03

왜 AutoCAD Plant 이어야 할까?

Report 모듈을 활용한 Output 산출



Linelist

Project:

| Tag | From | To |
|-------------|------------------|------------------|
| CW-15-BO-02 | CONCENTRIC REDUC | CONCENTRIC REDUC |
| CW-15-BO-02 | CONCENTRIC REDUC | CONCENTRIC REDUC |
| CW-20-BO-01 | CONCENTRIC REDUC | CONCENTRIC REDUC |
| CW-25-BO-01 | CONCENTRIC REDUC | TK-202 |
| CW-25-BO-01 | CW-50-BO-01 | CONCENTRIC REDUC |
| CW-25-BO-01 | CW-25-BO-01 | CW-25-BO-01 |
| CW-25-BO-01 | CW-25-BO-01 | CW-25-BO-01 |
| CW-25-BO-01 | CW-25-BO-01 | CW-25-BO-01 |
| CW-25-BO-01 | CW-25-BO-01 | SE-201 |
| CW-25-BO-01 | CW-25-BO-01 | SE-202 |
| CW-25-BO-02 | CONCENTRIC REDUC | CONCENTRIC REDUC |
| CW-25-BO-02 | CONCENTRIC REDUC | TK-203 |
| CW-25-BO-02 | CW-25-BO-02 | CW-25-BO-02 |
| CW-25-BO-02 | CW-25-BO-02 | CW-25-BO-02 |
| CW-25-BO-02 | CW-25-BO-02 | CW-25-BO-02 |
| CW-25-BO-02 | CW-25-BO-02 | CONCENTRIC REDUC |
| CW-25-BO-02 | CW-50-BO-01 | CW-25-BO-02 |
| CW-32-BO-01 | CW-40-BO-01 | CAP |
| CW-32-BO-01 | CW-32-BO-01 | CW-32-BO-01 |
| CW-32-BO-02 | CONCENTRIC REDUC | B-201B |
| CW-32-BO-02 | CW-32-BO-02 | CONCENTRIC REDUC |
| CW-32-BO-02 | CW-40-BO-01 | CAP |
| CW-32-BO-02 | CW-32-BO-02 | CW-32-BO-02 |
| CW-32-BO-03 | CW-32-BO-03 | CW-32-BO-03 |
| CW-32-BO-03 | CW-32-BO-03 | CONCENTRIC REDUC |
| CW-32-BO-03 | CONCENTRIC REDUC | B-201C |
| CW-32-BO-03 | CW-40-BO-01 | CAP |
| CW-32-BO-04 | CW-32-BO-04 | CAP |
| CW-32-BO-04 | CONCENTRIC REDUC | B-203A |
| CW-32-BO-04 | CW-40-BO-02 | CONCENTRIC REDUC |
| CW-32-BO-04 | CW-32-BO-04 | CW-32-BO-04 |
| CW-32-BO-05 | CW-32-BO-05 | CW-32-BO-05 |
| CW-32-BO-05 | CONCENTRIC REDUC | B-203B |
| CW-32-BO-05 | CW-40-BO-02 | CONCENTRIC REDUC |
| CW-32-BO-05 | CW-32-BO-05 | CAP |
| CW-32-BO-06 | CW-40-BO-02 | B-202A |
| CW-32-BO-06 | CW-32-BO-06 | CW-32-BO-06 |

Bill of Material

Autodesk

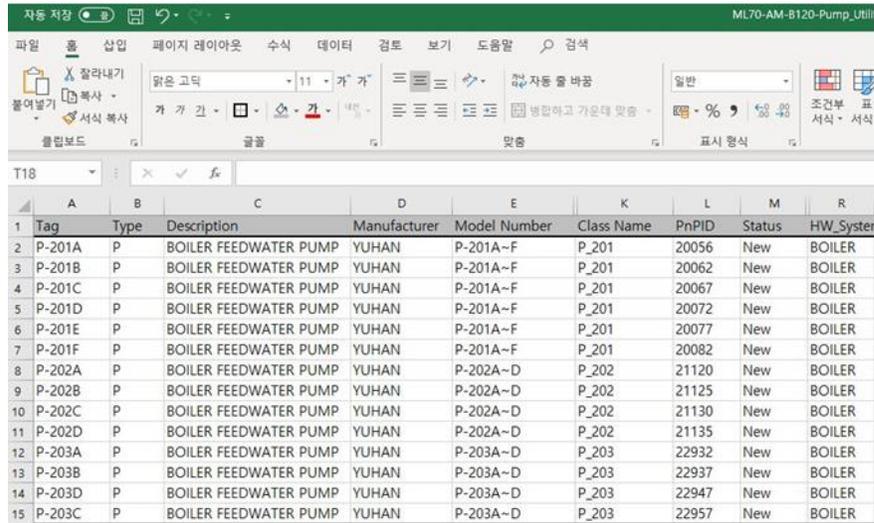
Project:

Note: Fixed-length pipes are not included in pipes.

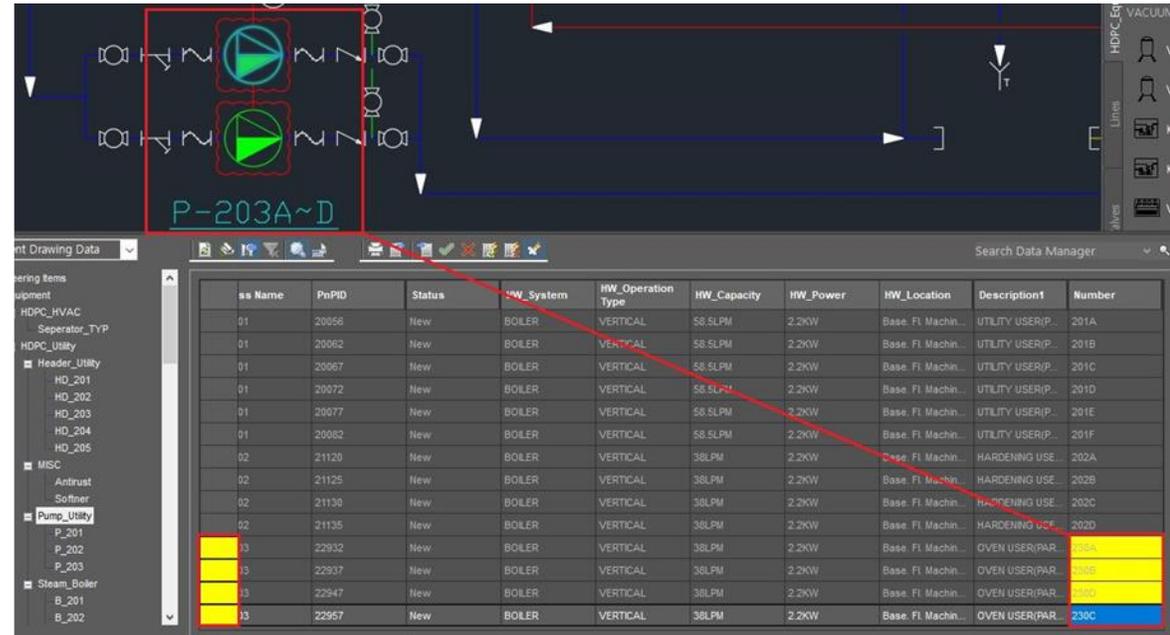
| Quantity | Unit | Description | ND | Standard | Schedule | Material | PN | Angle |
|--|------|---|-------|------------|----------|----------|-----|-------|
| Type: PIPE | | | | | | | | |
| 5203 | mm | PIPE, 65 ND, PL | 65 mm | JIS G 3452 | | | | |
| Type: BEND 90 LONG | | | | | | | | |
| 2 | | BEND 90 LONG, 65 ND, BV | 65 mm | JIS B 2311 | | | | |
| Type: FLANGE SO | | | | | | | | |
| 4 | | FLANGE SO, RF, 150 LB, JPI 7S 15 | 65 mm | JPI 7S 15 | | | 150 | |
| Type: BOLT SET | | | | | | | | |
| 4 | | MACHINE BOLT M16 X 90 LG, DIN 976 W/1 HEX. NUT M16, DIN 934, 2 WASHE | 65 mm | | | | 150 | |
| Type: GASKET, NONMETALLIC, FLAT, RING | | | | | | | | |
| 4 | | GASKET, NONMETALLIC, FLAT, RING, DN 65, 1.5 MM THK, 10K, RF, JIS B 2404 | 65 mm | JIS B 2404 | | | 150 | |
| Type: SlipOn | | | | | | | | |
| 4 | | SlipOn | 65 mm | | | | | |
| Type: BALL VALVE | | | | | | | | |
| 1 | | BALL VALVE, 65 ND, 150 LB, RF, JPI 7S 48, HandLever, H=155", W=400" | 65 mm | JPI 7S 48 | | | 150 | |
| Type: GLOBE VALVE | | | | | | | | |
| 1 | | GLOBE VALVE, 65 ND, 150 LB, RF, JPI 7S 46, HandWheel, H=379", W=250" | 65 mm | JPI 7S 46 | | | 150 | |

왜 AutoCAD Plant 이어야 할까?

엑셀을 활용한 P&ID 데이터 일괄 변경관리



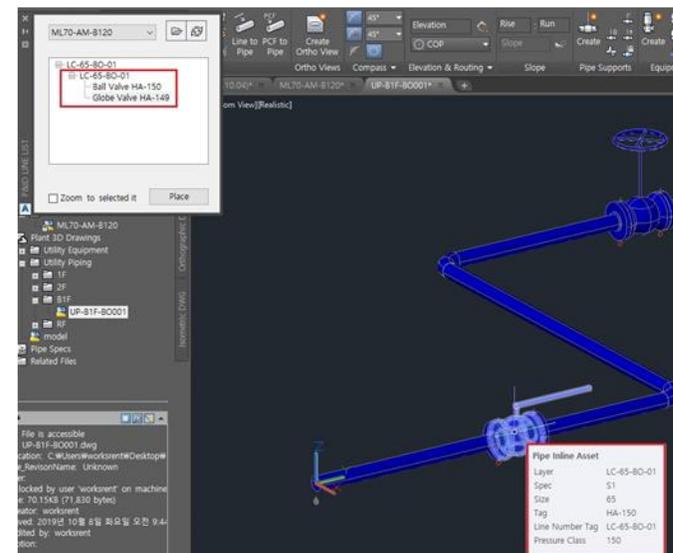
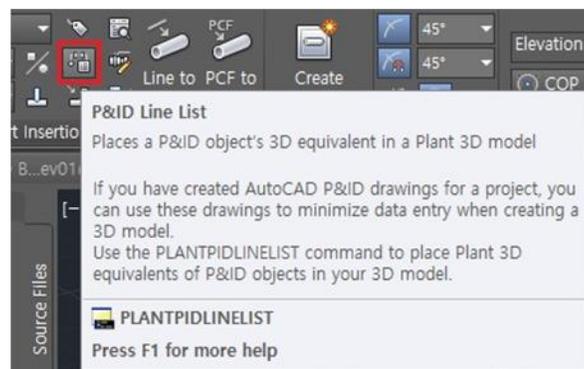
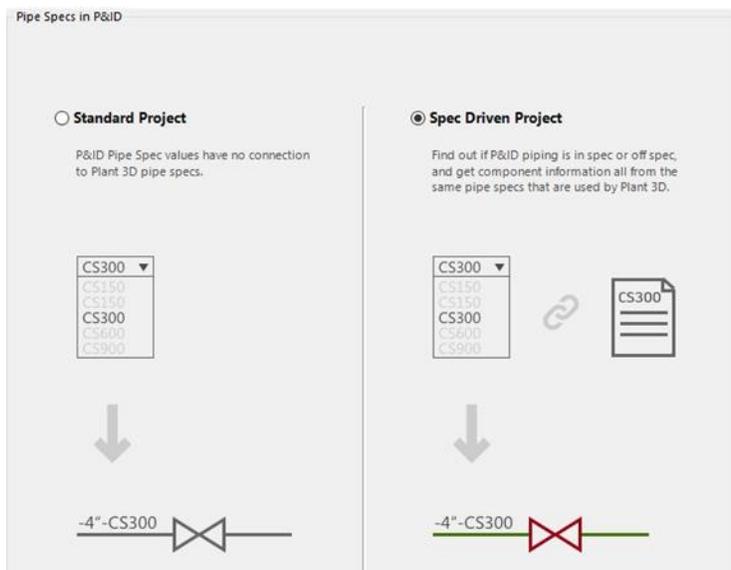
| Tag | Type | Description | Manufacturer | Model Number | Class Name | PnPID | Status | HW_System |
|--------|------|-----------------------|--------------|--------------|------------|-------|--------|-----------|
| P-201A | P | BOILER FEEDWATER PUMP | YUHAN | P-201A~F | P_201 | 20056 | New | BOILER |
| P-201B | P | BOILER FEEDWATER PUMP | YUHAN | P-201A~F | P_201 | 20062 | New | BOILER |
| P-201C | P | BOILER FEEDWATER PUMP | YUHAN | P-201A~F | P_201 | 20067 | New | BOILER |
| P-201D | P | BOILER FEEDWATER PUMP | YUHAN | P-201A~F | P_201 | 20072 | New | BOILER |
| P-201E | P | BOILER FEEDWATER PUMP | YUHAN | P-201A~F | P_201 | 20077 | New | BOILER |
| P-201F | P | BOILER FEEDWATER PUMP | YUHAN | P-201A~F | P_201 | 20082 | New | BOILER |
| P-202A | P | BOILER FEEDWATER PUMP | YUHAN | P-202A~D | P_202 | 21120 | New | BOILER |
| P-202B | P | BOILER FEEDWATER PUMP | YUHAN | P-202A~D | P_202 | 21125 | New | BOILER |
| P-202C | P | BOILER FEEDWATER PUMP | YUHAN | P-202A~D | P_202 | 21130 | New | BOILER |
| P-202D | P | BOILER FEEDWATER PUMP | YUHAN | P-202A~D | P_202 | 21135 | New | BOILER |
| P-203A | P | BOILER FEEDWATER PUMP | YUHAN | P-203A~D | P_203 | 22932 | New | BOILER |
| P-203B | P | BOILER FEEDWATER PUMP | YUHAN | P-203A~D | P_203 | 22937 | New | BOILER |
| P-203D | P | BOILER FEEDWATER PUMP | YUHAN | P-203A~D | P_203 | 22947 | New | BOILER |
| P-203C | P | BOILER FEEDWATER PUMP | YUHAN | P-203A~D | P_203 | 22957 | New | BOILER |



| Asset Name | PnPID | Status | HW_System | HW_Operation Type | HW_Capacity | HW_Power | HW_Location | Description1 | Number |
|------------|-------|--------|-----------|-------------------|-------------|----------|---------------------|-------------------|--------|
| 01 | 20056 | New | BOILER | VERTICAL | 58.5LPM | 2.2KW | Base. Fl. Machin... | UTILITY USER(P... | 201A |
| 01 | 20062 | New | BOILER | VERTICAL | 58.5LPM | 2.2KW | Base. Fl. Machin... | UTILITY USER(P... | 201B |
| 01 | 20067 | New | BOILER | VERTICAL | 58.5LPM | 2.2KW | Base. Fl. Machin... | UTILITY USER(P... | 201C |
| 01 | 20072 | New | BOILER | VERTICAL | 58.5LPM | 2.2KW | Base. Fl. Machin... | UTILITY USER(P... | 201D |
| 01 | 20077 | New | BOILER | VERTICAL | 58.5LPM | 2.2KW | Base. Fl. Machin... | UTILITY USER(P... | 201E |
| 01 | 20082 | New | BOILER | VERTICAL | 58.5LPM | 2.2KW | Base. Fl. Machin... | UTILITY USER(P... | 201F |
| 02 | 21120 | New | BOILER | VERTICAL | 38LPM | 2.2KW | Base. Fl. Machin... | HARDENING USE... | 202A |
| 02 | 21125 | New | BOILER | VERTICAL | 38LPM | 2.2KW | Base. Fl. Machin... | HARDENING USE... | 202B |
| 02 | 21130 | New | BOILER | VERTICAL | 38LPM | 2.2KW | Base. Fl. Machin... | HARDENING USE... | 202C |
| 02 | 21135 | New | BOILER | VERTICAL | 38LPM | 2.2KW | Base. Fl. Machin... | HARDENING USE... | 202D |
| 03 | 22932 | New | BOILER | VERTICAL | 38LPM | 2.2KW | Base. Fl. Machin... | OVEN USER/PAR... | 203A |
| 03 | 22937 | New | BOILER | VERTICAL | 38LPM | 2.2KW | Base. Fl. Machin... | OVEN USER/PAR... | 203B |
| 03 | 22947 | New | BOILER | VERTICAL | 38LPM | 2.2KW | Base. Fl. Machin... | OVEN USER/PAR... | 203D |
| 03 | 22957 | New | BOILER | VERTICAL | 38LPM | 2.2KW | Base. Fl. Machin... | OVEN USER/PAR... | 203C |

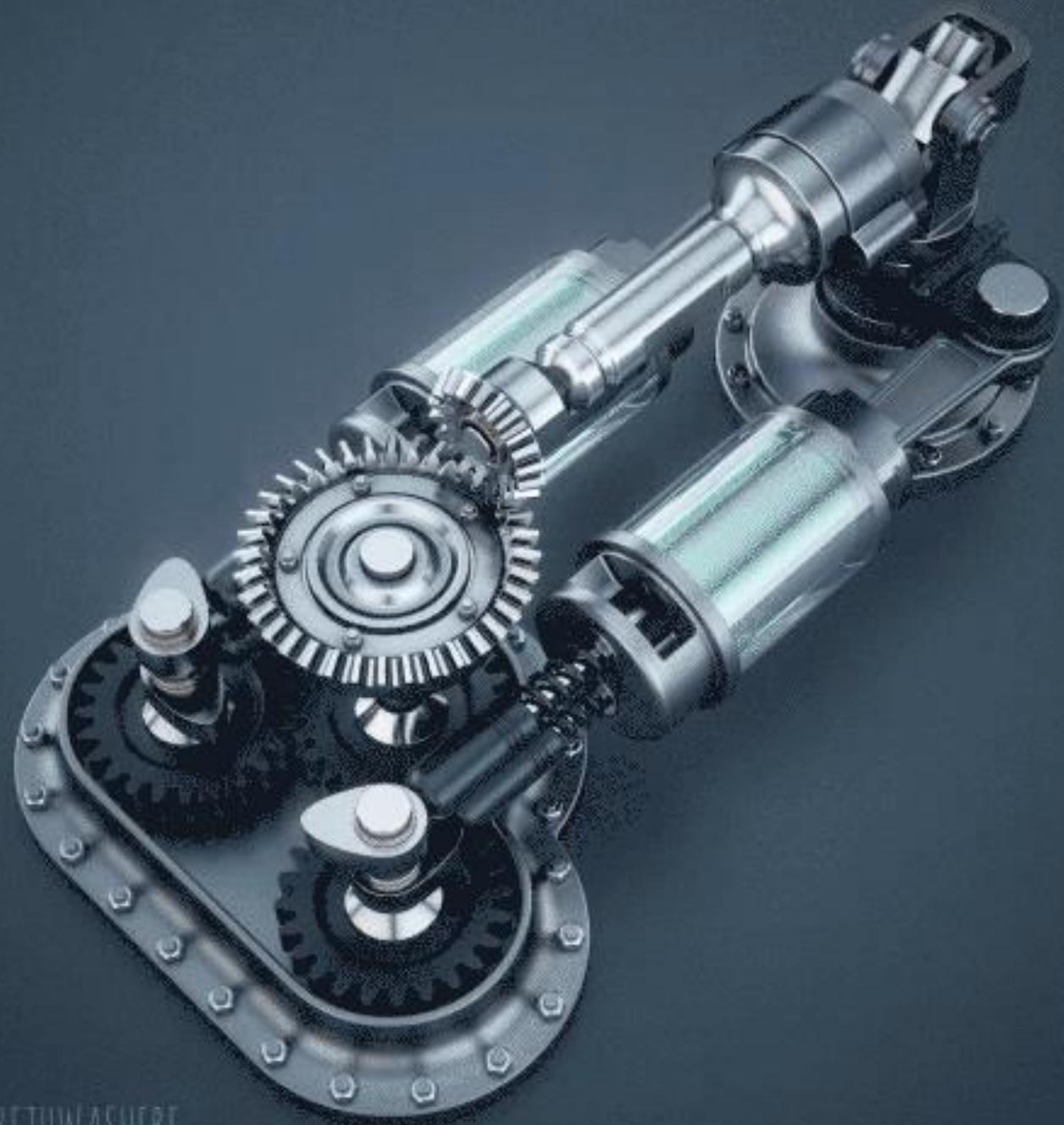
왜 AutoCAD Plant 이어야 할까?

P&ID to 3D Model 데이터 링크

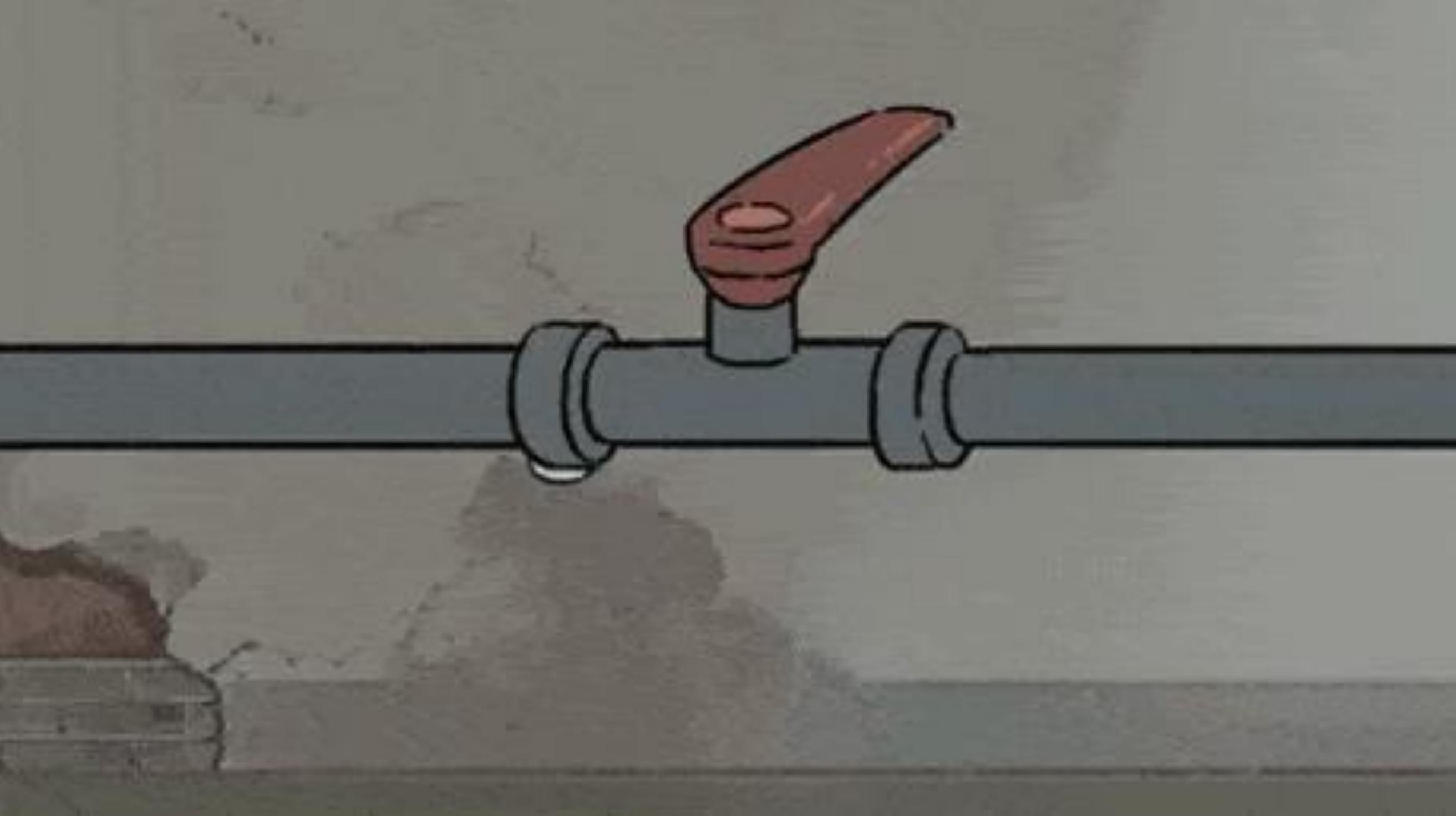


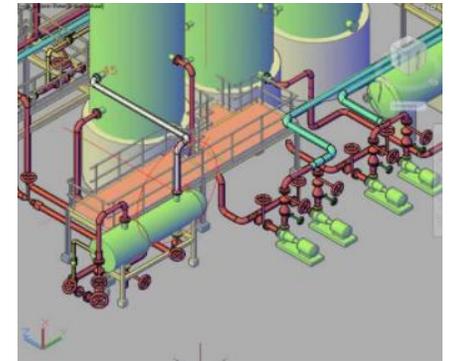
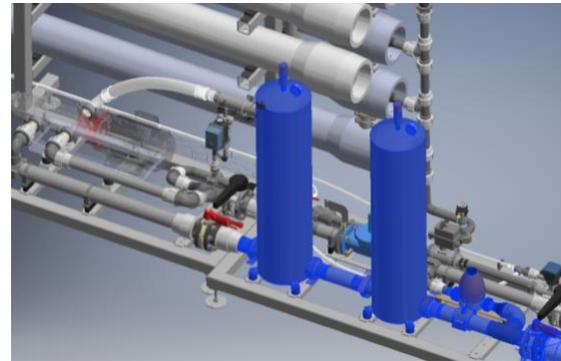
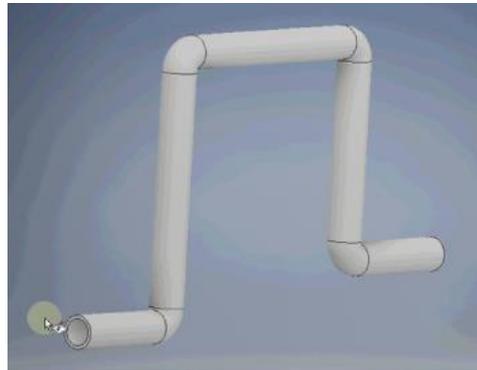
A high-quality 3D rendered image of a car's interior, showing the steering wheel, dashboard, and seats. The image is semi-transparent, allowing the text to be overlaid. The background features a geometric pattern of overlapping triangles in shades of gray and white.

기계설계 프로그램에서의 배관 모델링



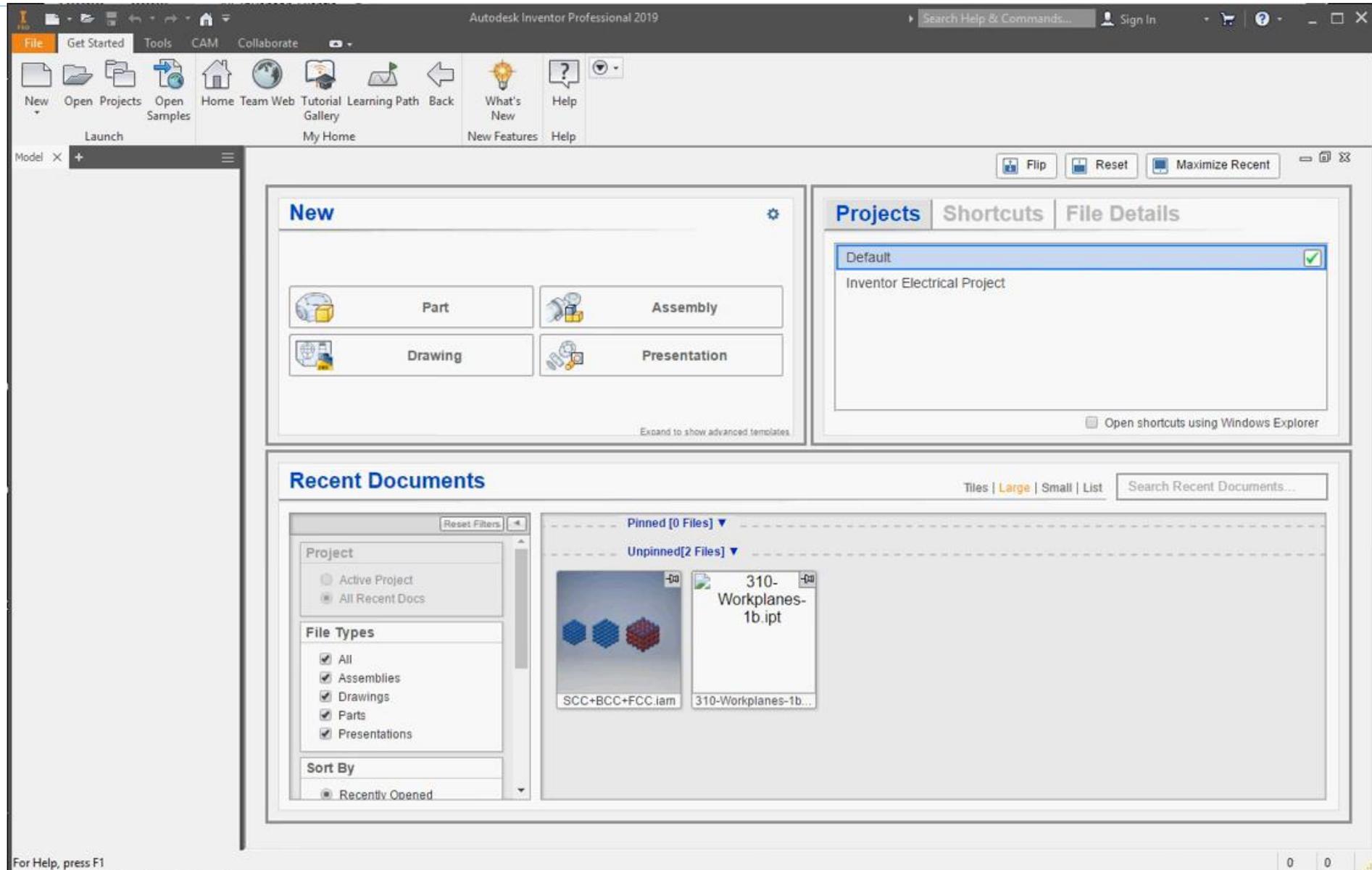
GARETH WASHBURN



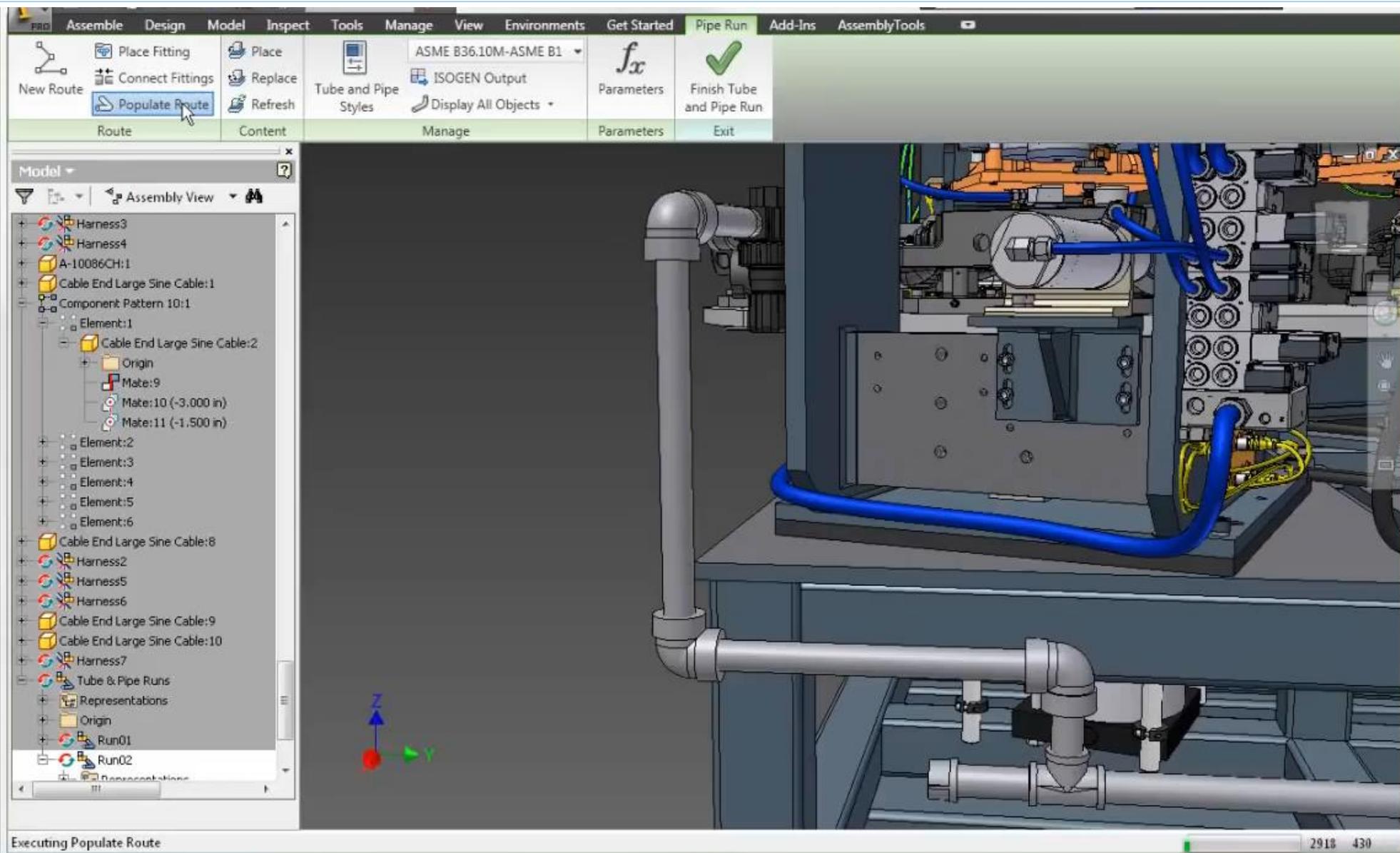


| | 기본기능 활용 | 기본기능 활용 | 기본기능 활용 | Plant 프로그램 활용 |
|---------|------------------------------------|--------------------------------------|--------------------------------|------------------------|
| 활용 프로그램 | Autodesk Inventor • Sweep 기능 활용 | Autodesk Inventor • Tube & Piping | Autodesk Inventor • i-Logic | • Autodesk Plant 3D |
| 장점 | 사용하기 쉬움 | 수정이 용이함 | 사용하기 쉬움 | P&ID, ISO 데이터가 모두 연동 됨 |
| 단점 | 수정과 편집에 많은 시간 소요 | 라이브러리 정의가 필요 | 조금의 개발(?)이 필요 | Inventor에서 데이터 활용 어려움 |

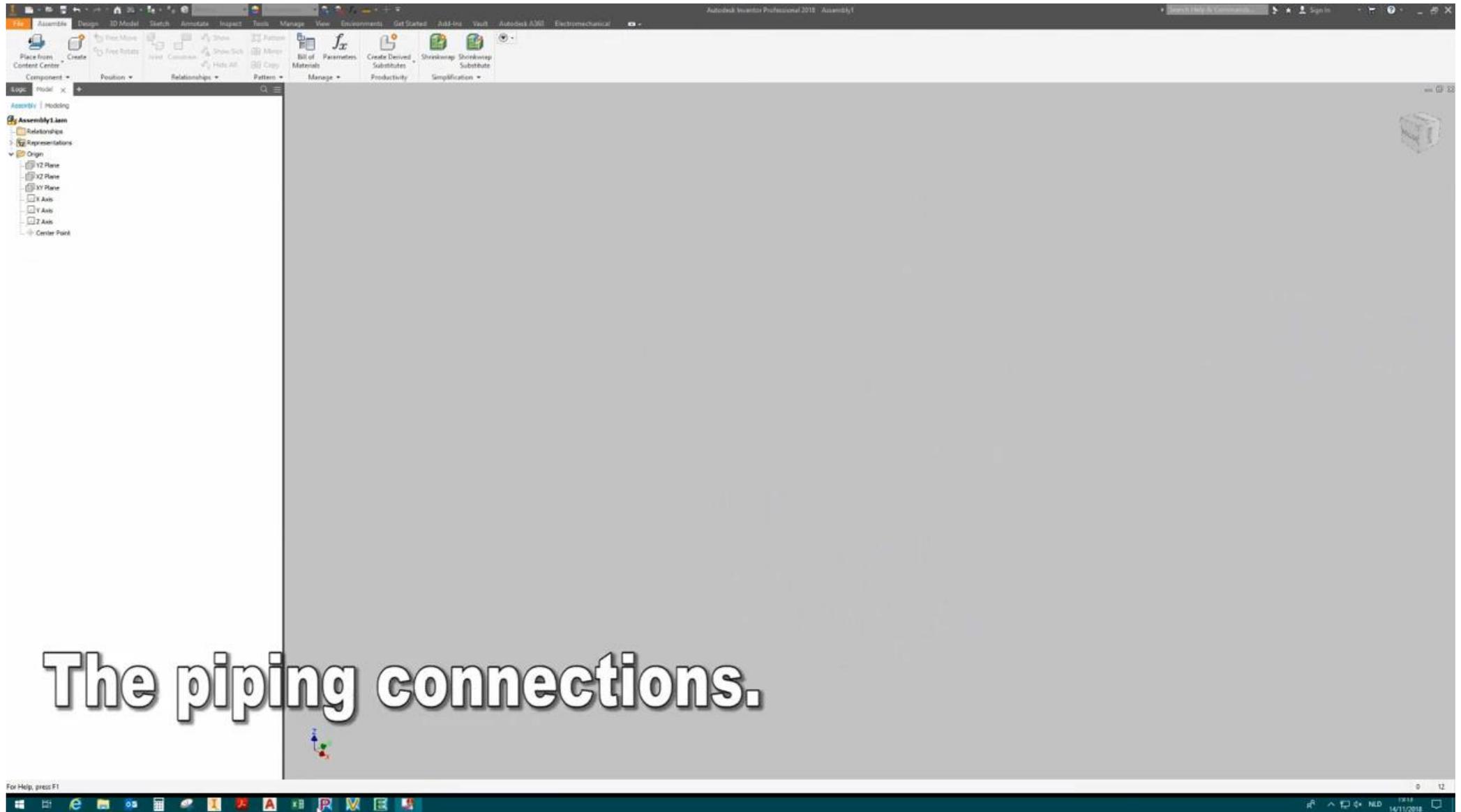
Inventor / Sweep



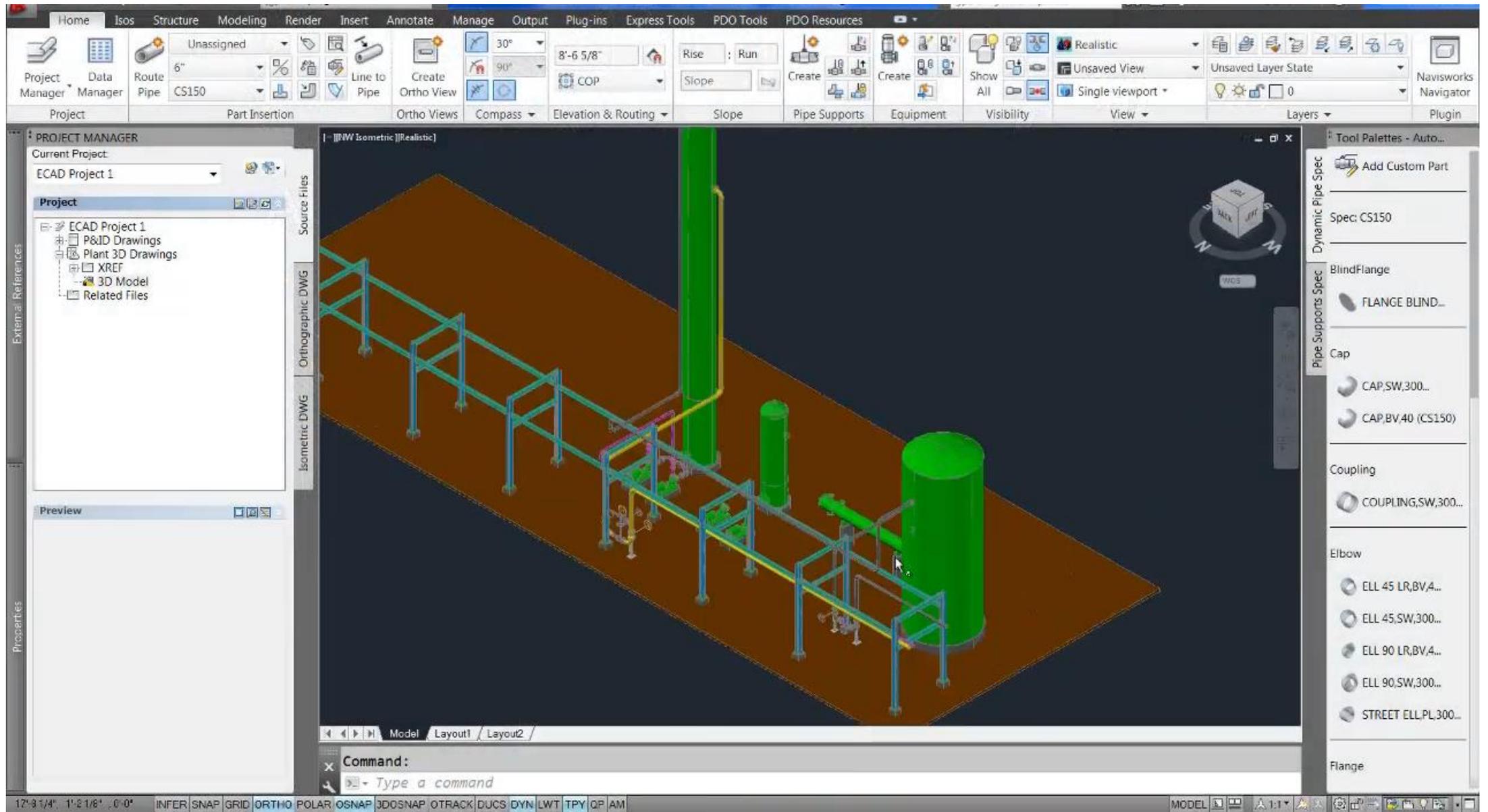
Inventor / Tube & Piping



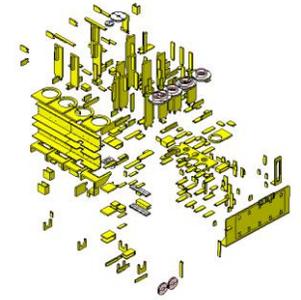
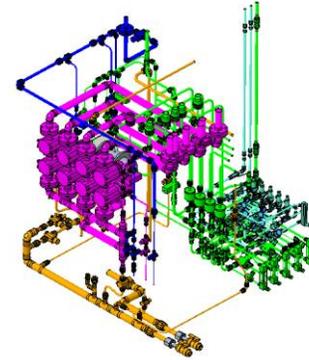
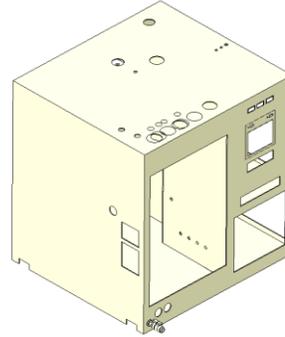
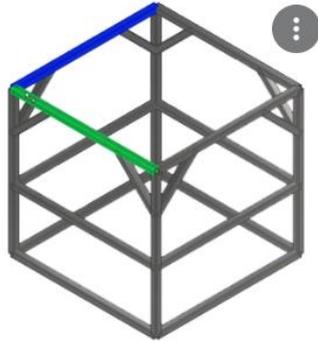
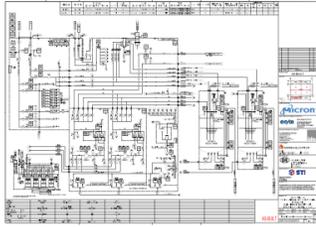
Inventor / i-Logic



AutoCAD Plant 3D / Plant 프로그램 사용



As-Is vs To-Be

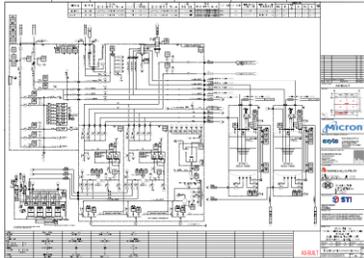


| | P & ID 작성 | Frame Model | Body Model | Piping Model | Support Model |
|--------------|--|---|---|--|---|
| 설계내용 | <ul style="list-style-type: none"> • P&ID 설계 및 Draft • 속성 데이터 입력 | <ul style="list-style-type: none"> • Frame 설계 및 모델링 | <ul style="list-style-type: none"> • Body(판재) 설계 및 모델링 • 기타 액세서리 설계 및 모델링 | <ul style="list-style-type: none"> • Piping 설계 및 모델링 | <ul style="list-style-type: none"> • Support 설계 및 모델링 |
| 설계성과품 | <ul style="list-style-type: none"> • P&ID Drawing • Part BOM | <ul style="list-style-type: none"> • 제작도면 • BOM | <ul style="list-style-type: none"> • 제작도면 • BOM | <ul style="list-style-type: none"> • ISO Drawing • BOM • 제작도면 | <ul style="list-style-type: none"> • 제작도면 (배치도 및 단품도) • BOM |
| As-Is | AutoCAD (2D CAD) | Autodesk Inventor | Autodesk Inventor | Autodesk Inventor | Autodesk Inventor |
| To-Be | AutoCAD Plant 3D (Intelligent P&ID) | | | AutoCAD Plant 3D | |

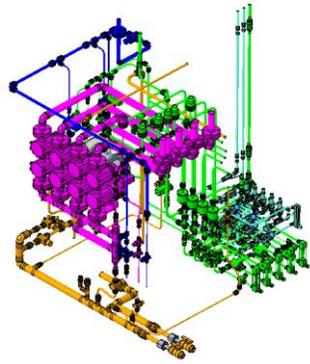
각 제품별 주요 기능 소개

| | AutoCAD Plant 3D (P&ID) | AutoCAD Plant 3D | Autodesk Inventor |
|---------------|--|---|---|
| 1. 프로그램 활용 범위 | <ul style="list-style-type: none"> • P&ID 작성 • 물량 산출 및 리포트 생성 • 캐드 블록 활용하여 라이브러리 생성 가능 • 심볼 구축되면 바로 적용가능 | <ul style="list-style-type: none"> • Piping 모델링 • ISO Drawing 생성 • BOM 산출 • Spec 및 Catalog 구축 되면 바로 모델링 적용 가능 | <ul style="list-style-type: none"> • 프레임 및 바디, 가공품 등 모델링 가능 • 제작도면 생성 가능 |
| 2. 이슈 | | <ul style="list-style-type: none"> • BODY 모델링 불가 • 가공품 모델링 불가 • 제작도면 생성 불가 | <ul style="list-style-type: none"> • AutoCAD Plant 3D 데이터를 직접 가져올 수 없음 |
| 3. 해결 방안 | | | <ul style="list-style-type: none"> • 별도 3rd party를 이용하여 Plant 3D 데이터를 Load 할 수 있음 |

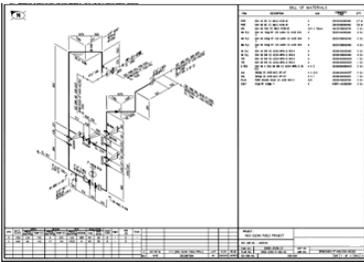
AutoCAD Plant3D



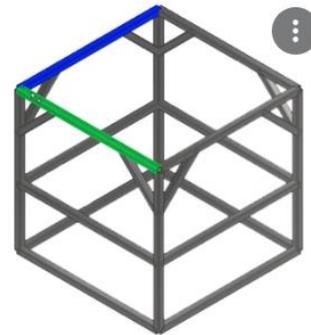
P&ID



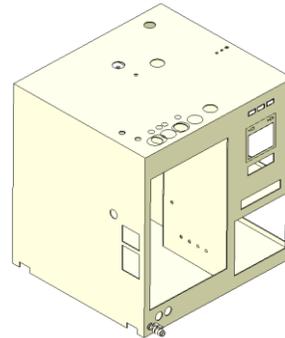
Piping



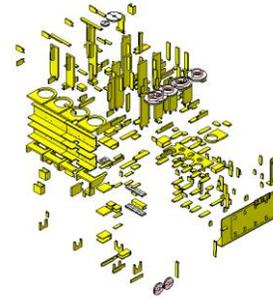
ISO / BOM



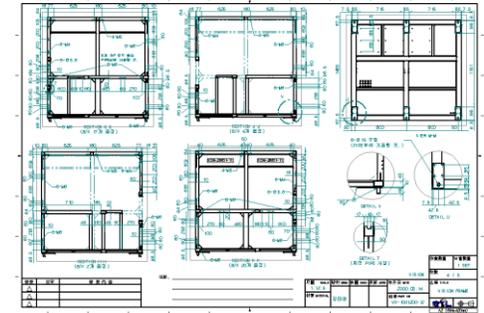
Frame



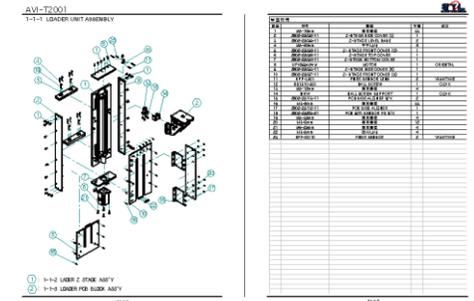
Body



Support



Production DWG

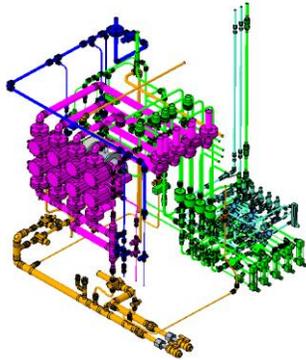
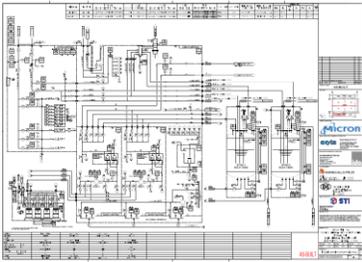


BOM

Inventor

Plant3D – [BIMDeX] - Inventor

AutoCAD Plant3D

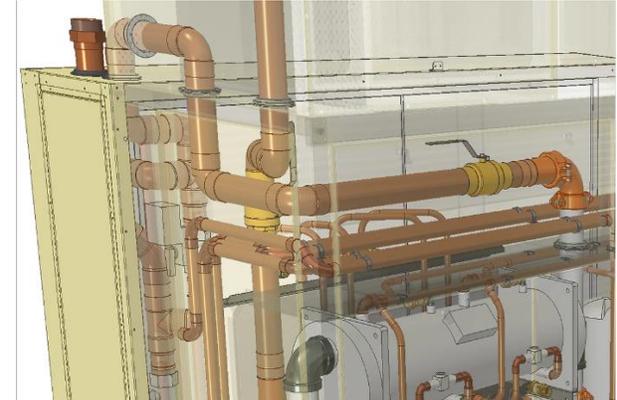


- P&ID Drawing
- Piping Model
- ISO Drawing
- Equipment Model

- Plant 3D – Inventor
데이터 변환(*.BXF)



Inventor



- Frame, Body Model
- Plant 3D data Import (*.BXF)
- Support Model
- BIM Exchange

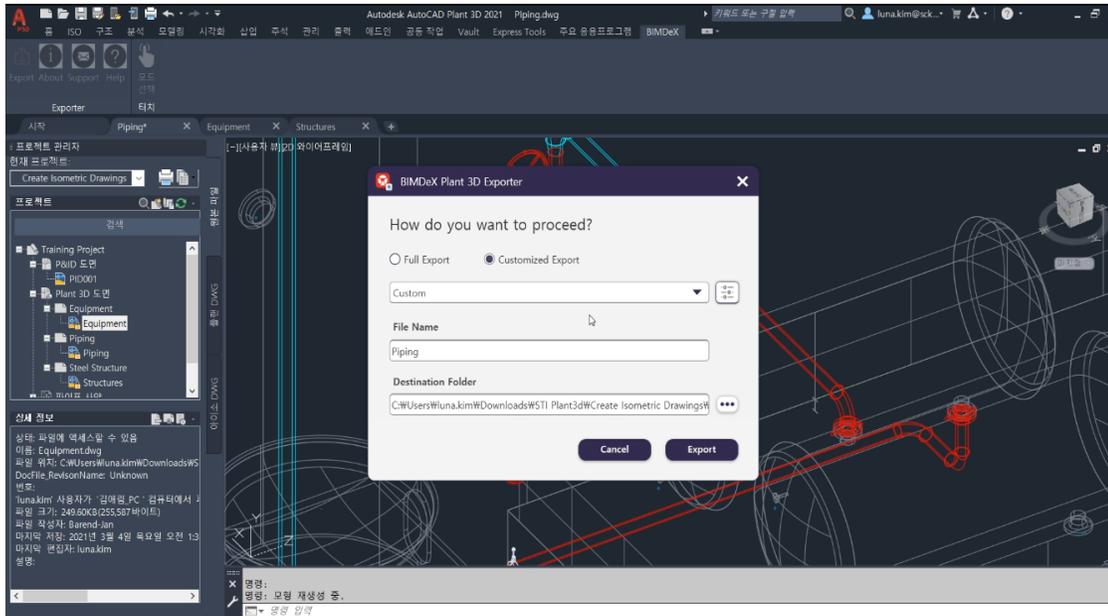
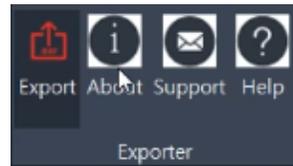
Vault Professional

*.ADSK

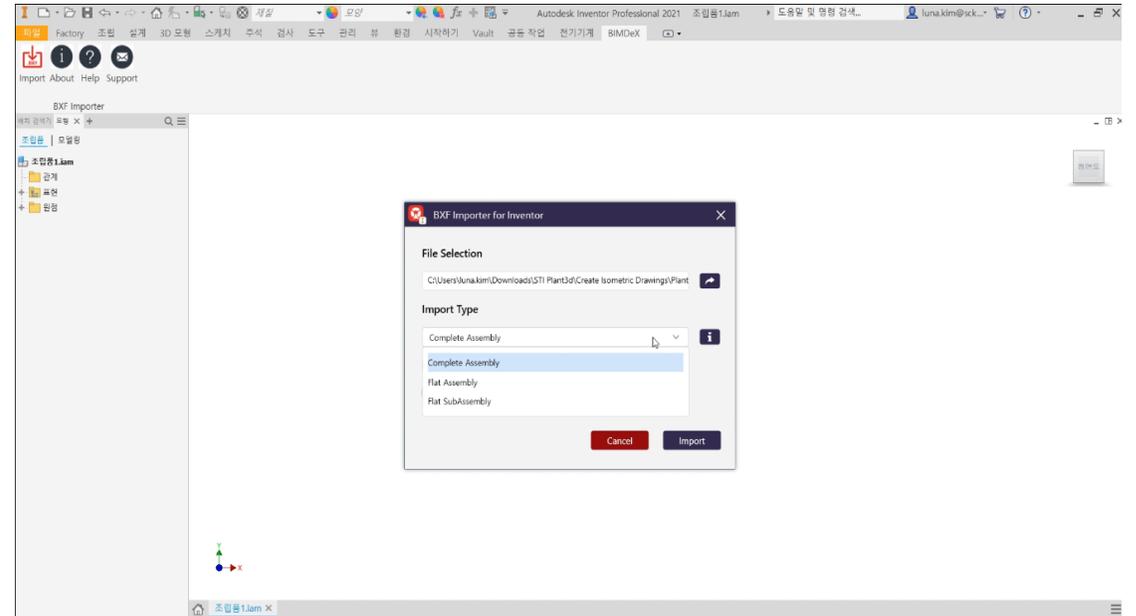
BIMDeX 변환과정

<https://youtu.be/ioLFjqoF9mQ>

Export *.bxf



Import *.bxf



PROJECT MANAGER

Current Project

SampleProject

Project

Search

- SampleProject
 - P&ID Drawings
 - Plant 3D Drawings
 - Pipe Specs
 - Related Files

Details

Project XML: C:\Users\nitesh\AppData\Roaming\Autodesk\Plant 3D\Projects\SampleProject.xml

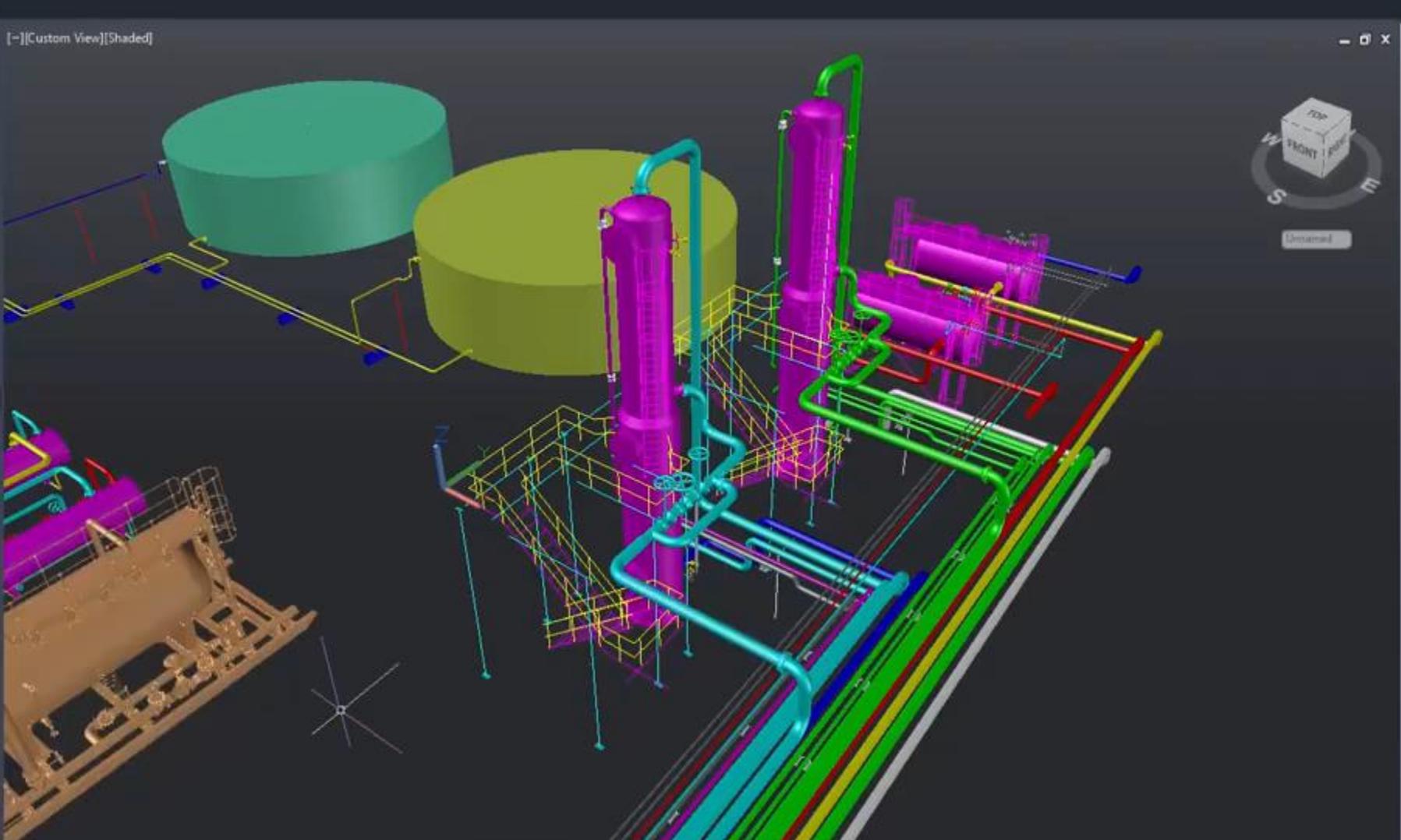
Project name: SampleProject

Project description: Sample Project

P&ID project unit: PIP Imperial

PROPERTIES

No selection



TOOL PALETTES - AUTOCAD

Dynamic Pipe Spec

Spec: CS300

Pipe Supports Spec

BlindFlange

- FLANGE BLIND,FL,RF,300 (CS300)

Cap

- CAP,BV,40 (CS300)

Instrumentation Spec

Coupling

- COUPLING,SW,3000 (CS300)

Cross

- Cross,SW,3000 (CS300)

Elbow

- ELL 45 LR,BV,40 (CS300)
- ELL 45,SW,3000 (CS300)
- ELL 90 LR,BV,40 (CS300)
- ELL 90,SW,3000 (CS300)

Flange

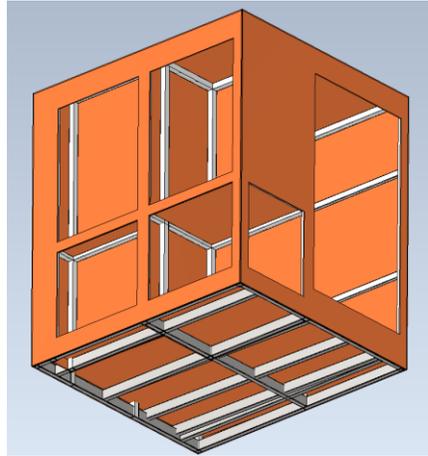
- FLANGE SW,FL,RF,300 (CS300)

[-][Custom View][Shaded]

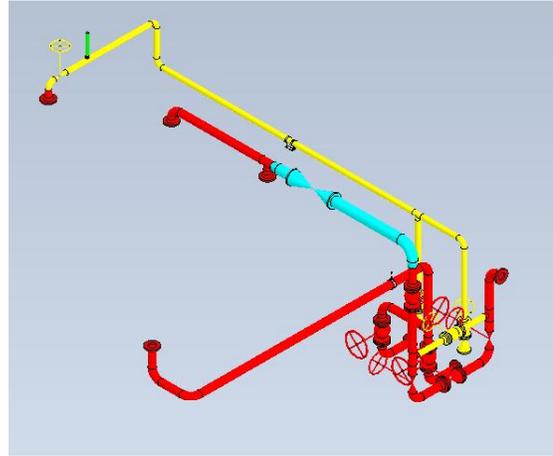
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Type a command

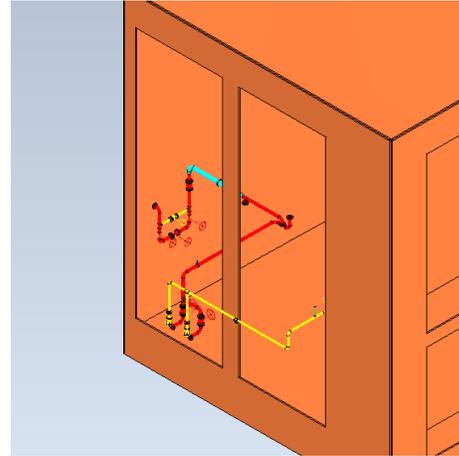
Inventor 와 BIMDeX 데이터를 활용한 설계



Body 및 Frame 설계



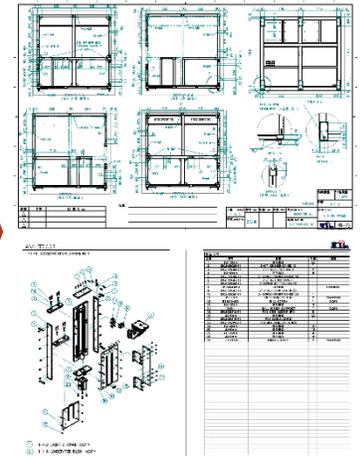
Pipe 불러오기(bxf)



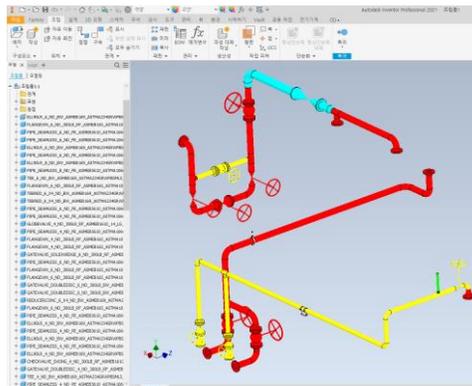
조립



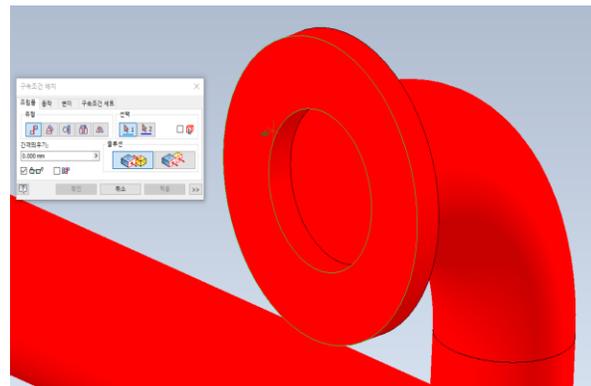
서포트 설계



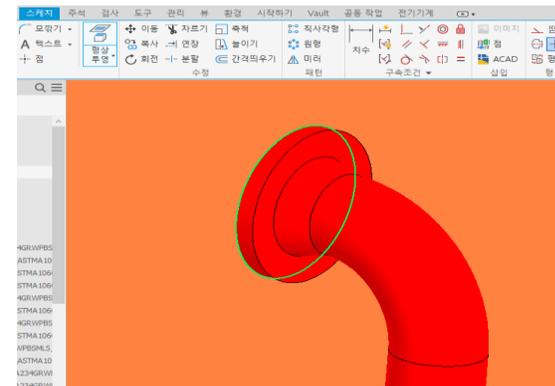
도면/BOM



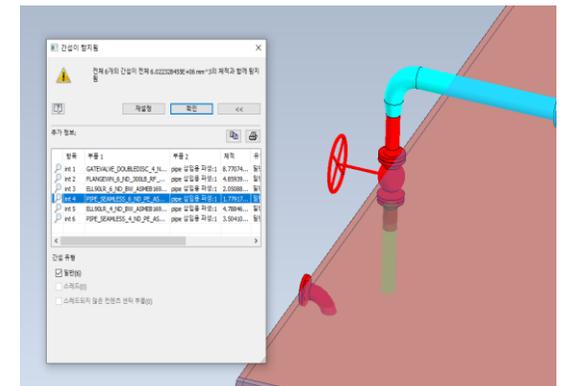
부품 별 Solid 형태로 삽입



구속조건을 통하여 조립 가능



형상 참조 가능



Body와 Pipe 간 간섭체크 가능



ACC (Autodesk Construction Cloud)





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