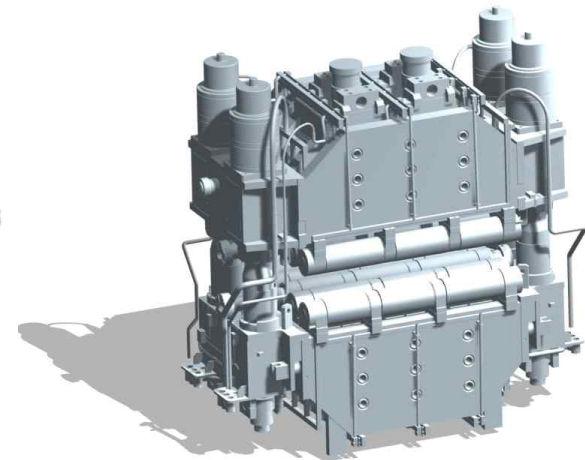
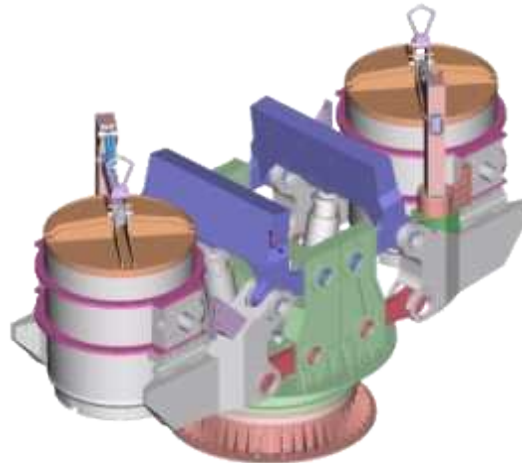
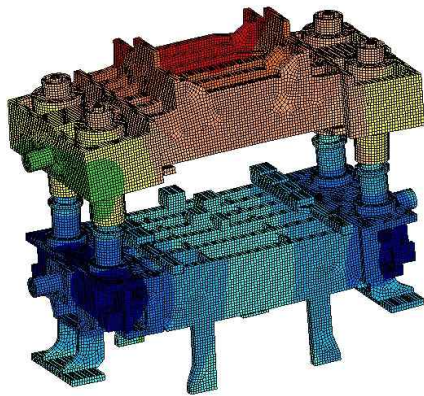


Hi, FEA

High Performance, Fast, Easy & Accurate

(주)삼원밀레니아 회사 소개서



Samwon Millennia

(주)삼원밀레니아

목 차

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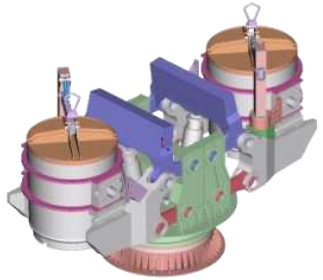
2. 보유 기술

3. 주요 수행 프로젝트

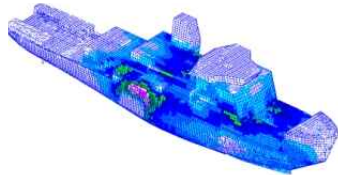
1. 회사개요

업 체 명	(주)삼원밀레니아	대 표 자	이 지 현
설 립 일 자	2001년 09월 14일	주 생 산 품	신재생에너지 설비, 엔지니어링 서비스 외
본 사 소 재 지	경기도 용인시 기흥구 중부대로 182 기흥혁신유타워 지식산업센터 1607호		

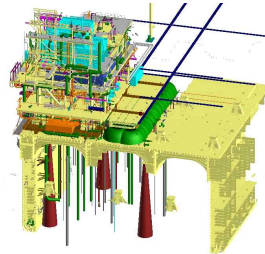
- ※ 2011. 05 벤처기업 확인 (제20110102364호)
- ※ 2010. 04 이노비즈 확인 (제R7062-1449호)
- ※ 2002. 07 기술연구소 인정 (제20021972호)
- ※ 2016. 04 청년 친화 강소기업 인증
- ※ 2020. 07 수출 유망 중소기업 지정
- ※ 2020. 11 일자리 창출 우수기업 인증



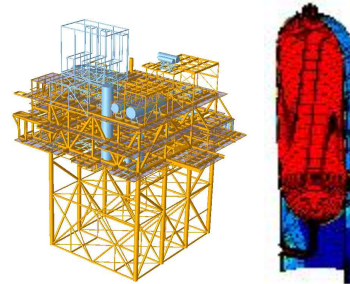
제철설비



조선/해양



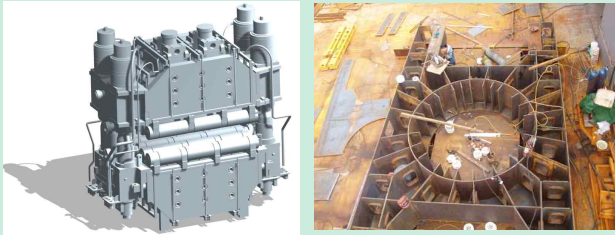
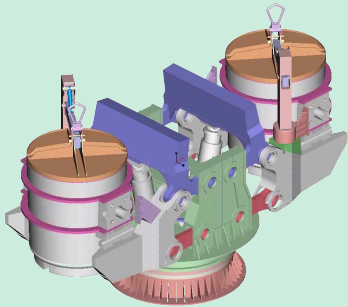
플랜트



풍력발전기/태양광발전

2. 보유기술

연주설비 설계



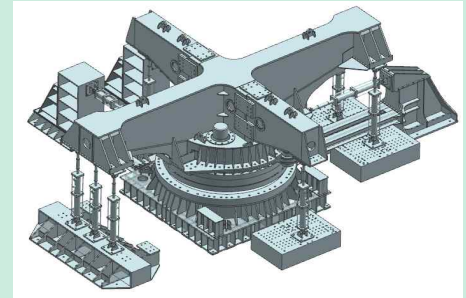
연주설비의
설계, 해석, 제작

크레인 개발



크레인의
설계, 해석, 제작

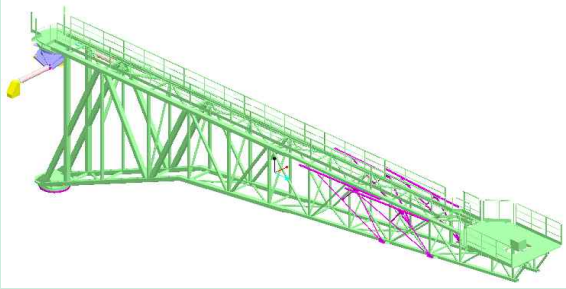
시험 장비 개발



시험 장비의
설계, 해석, 제작

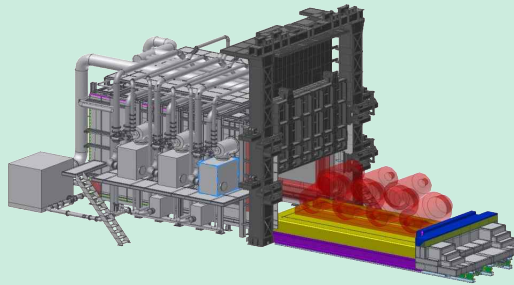
2. 보유기술

Burner boom 개발



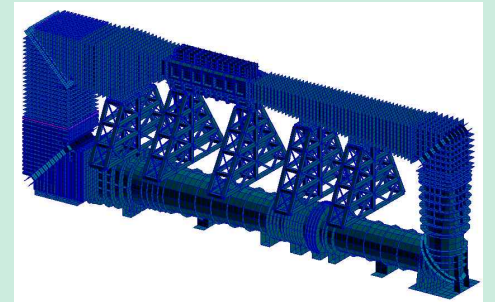
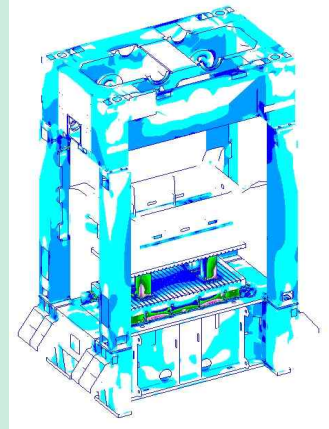
Burner boom의
설계, 해석

가열로 설계



가열로의
설계, 해석

대형 구조물의 설계/해석



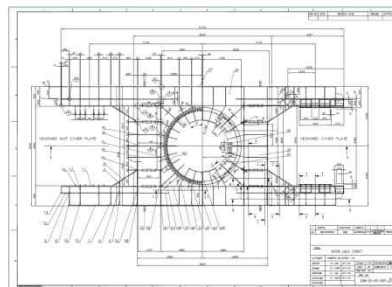
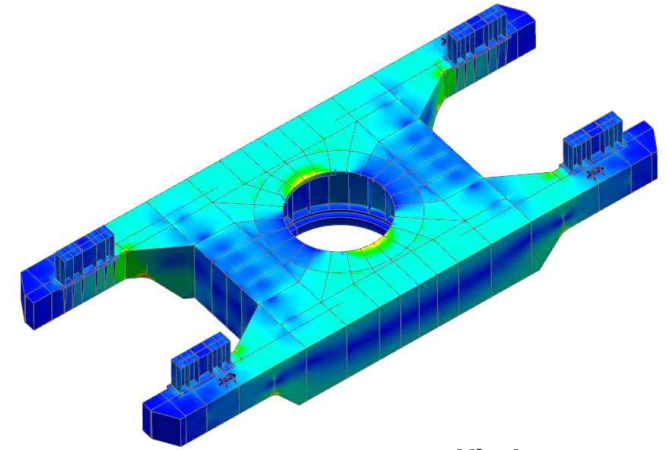
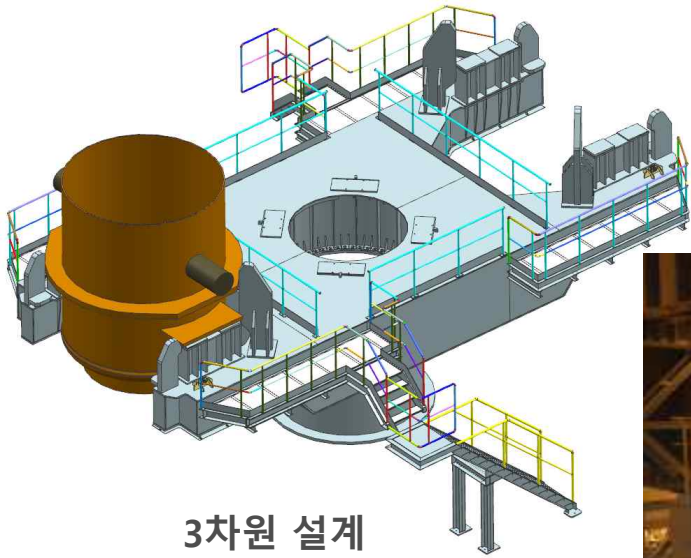
대형 구조물의
설계, 해석

3. 주요수행프로젝트

- 제철/중공업 분야 -

90ton Ladle Turret 재설계 및 제작

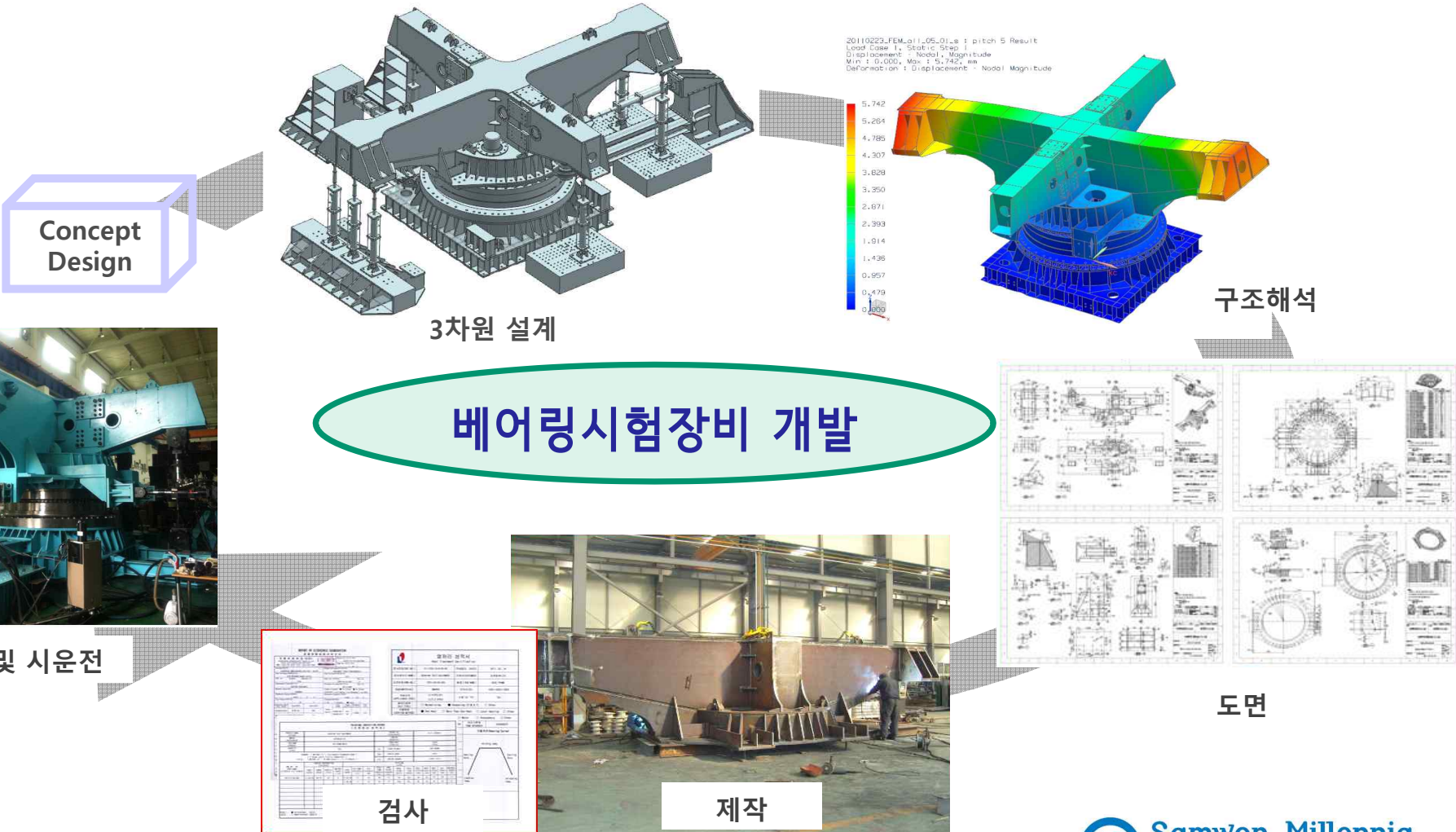
- 현재 설치되어 있는 외국 업체의 제철 설비 개보수를 위하여 엔지니어링 기술은 필수적 이다.
- 축적된 제철 분야의 엔지니어링 기술을 바탕으로 90ton Ladle Turret의 재설계 및 제작을 수행하였다.



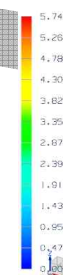
3MW급 풍력용 Bearing(Yaw/Pitch) 시험장비 개발

- 풍력발전기는 20년 이상의 내구수명을 확보해야 한다. 이 시험을 위한 3MW급 풍력발전기용 Yaw/Pitch Bearing의 시험 장비를 국내 최초로 개발하였으며, 현재 한국기계연구원에서 운영 중 이다.

가력기 용량 : 액츄에이터 200ton~300ton



20110223_FEM_all_01.s : pitch 5 Result
 Load Case 1 : Static Step 1
 Displacement : Nodal Magnitude
 Min : 0.000, Max : 5.742, ave
 Deformation : Displacement : Nodal Magnitude



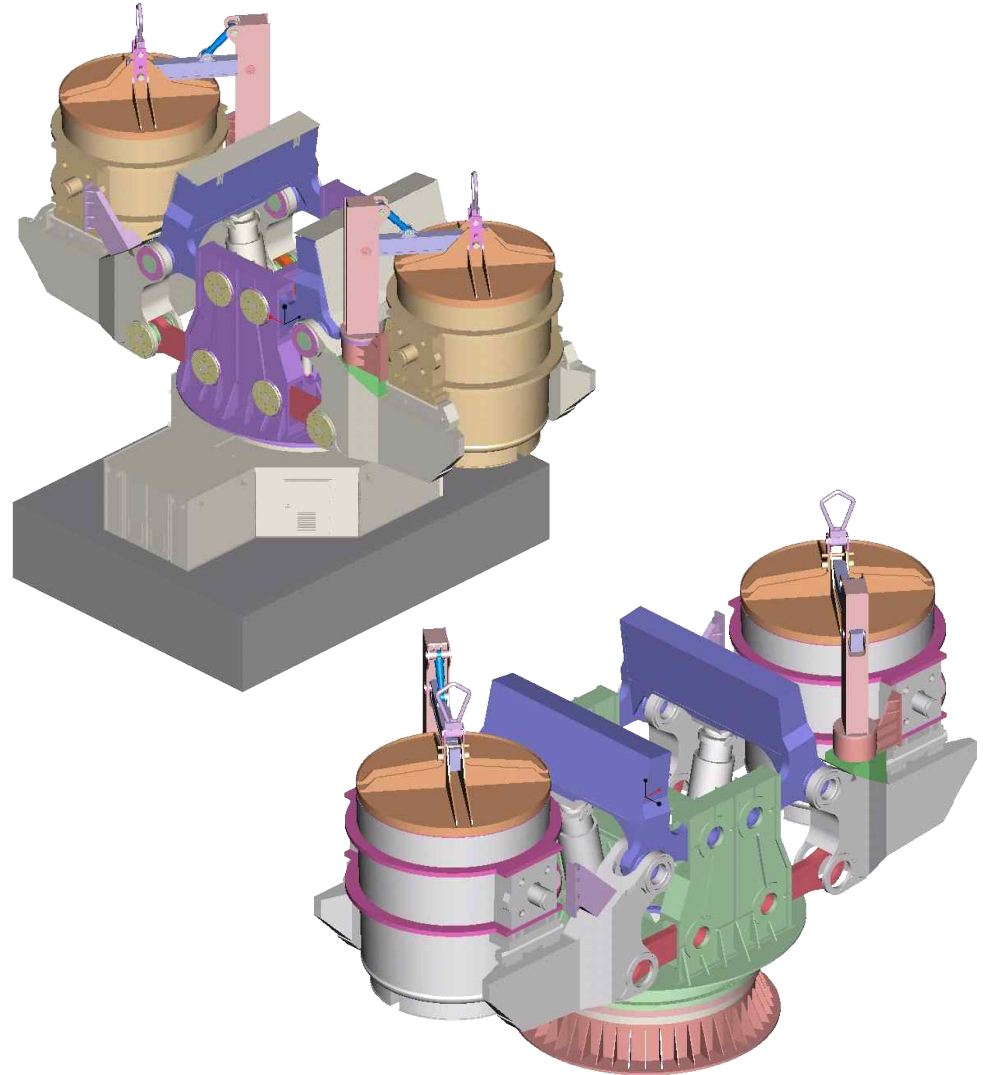
구분	항목	내용	비고
1. 일반사항	1.1. 시험목적	베어링 시험장비 개발	
	1.2. 시험대상	3MW급 풍력용 Yaw/Pitch Bearing	
	1.3. 시험장소	한국기계연구원	
	1.4. 시험일자	2011.02.23	
2. 시험방법	2.1. 시험방법	정적 하중 시험	
	2.2. 시험속도	0.001mm/min	
	2.3. 시험하중	200ton ~ 300ton	
	2.4. 시험시간	1시간	
3. 시험결과	3.1. 시험결과	시험장비 개발 완료	
	3.2. 시험결과	시험장비 개발 완료	
	3.3. 시험결과	시험장비 개발 완료	
	3.4. 시험결과	시험장비 개발 완료	

300톤 Ladle Turret 개발

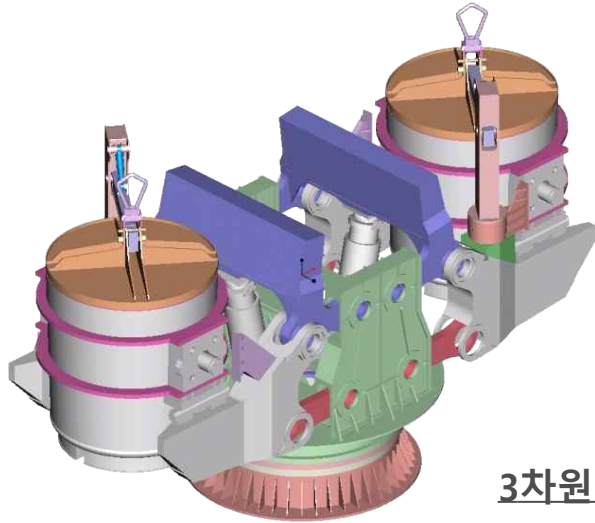
- 3차원 설계 및 CAE 기술을 이용한 국내의 기술로 300톤 Ladle Turret의 설계국산화를 하였다.



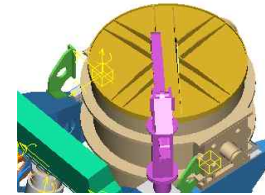
Ladle Turret



300톤 Ladle Turret 개발(계속)

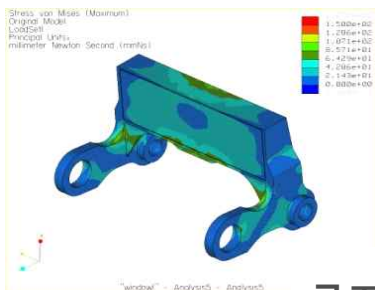
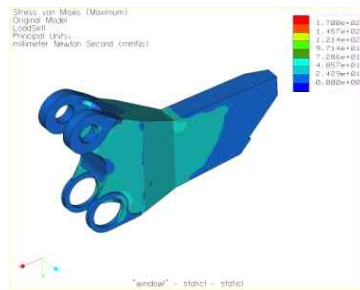
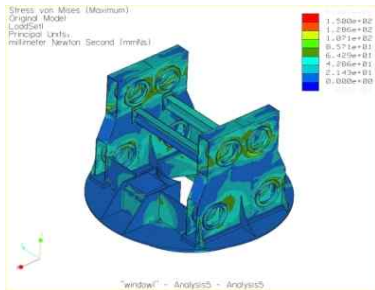


3차원 설계



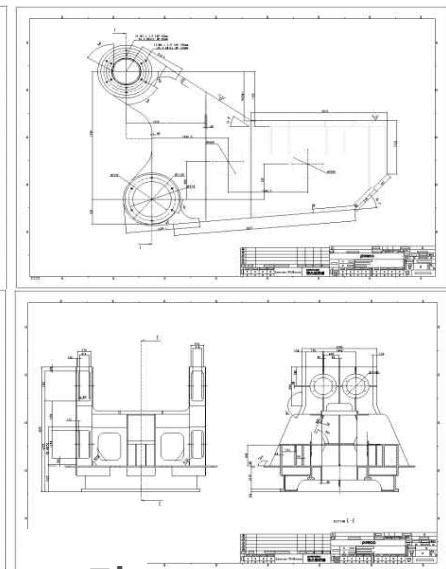
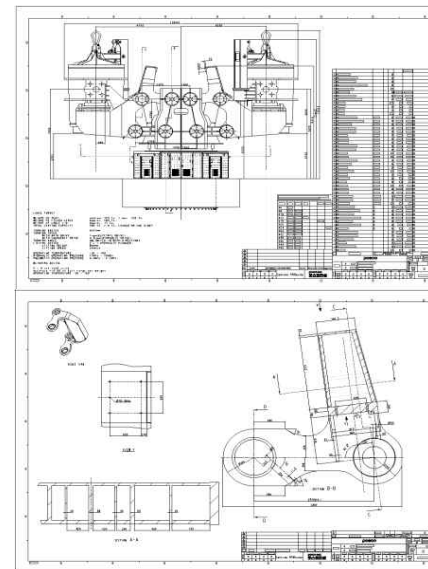
동역학 해석

Reaction Force



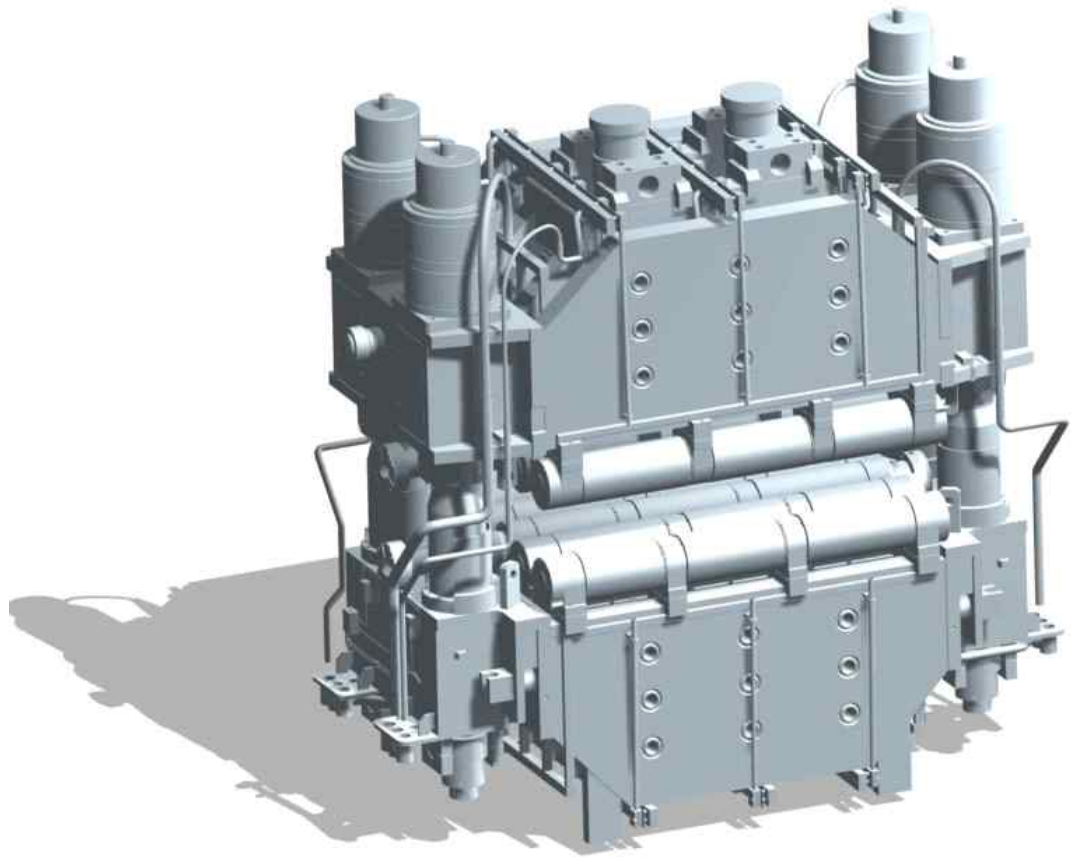
구조해석

"window" - static - static



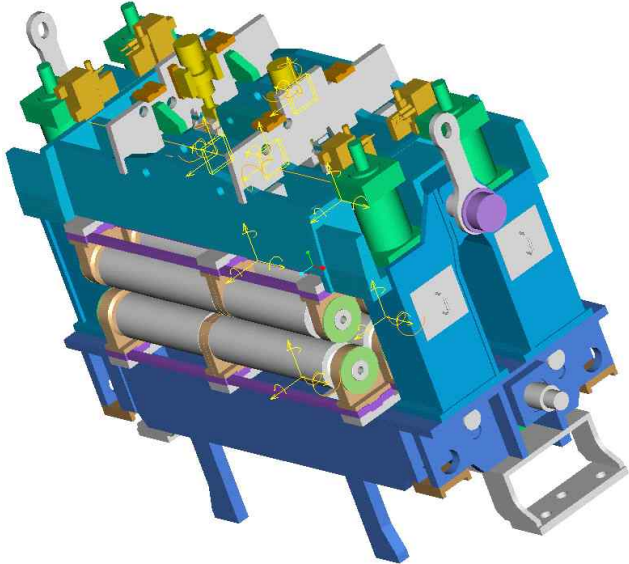
도면

POSHARP Segment 기본설계

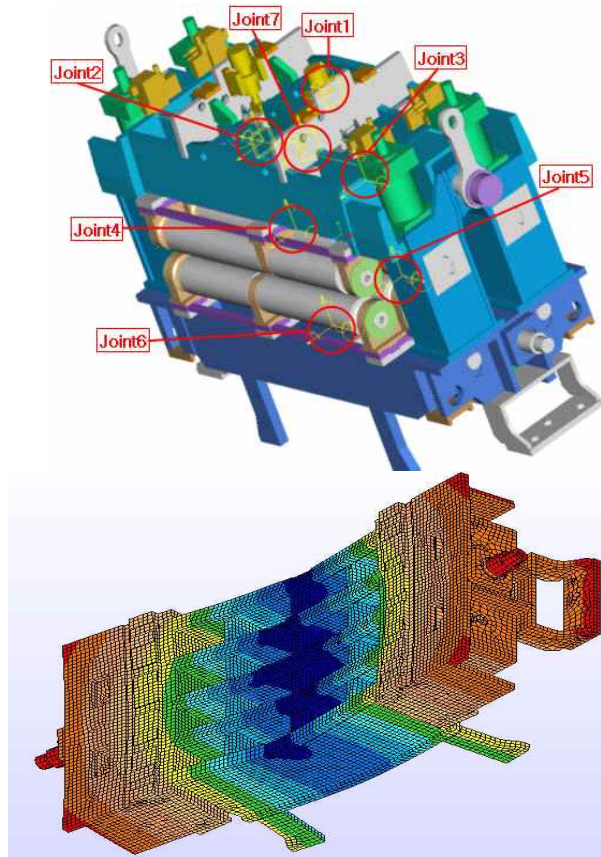


POSCO형 연주설비(국산화) - Segment

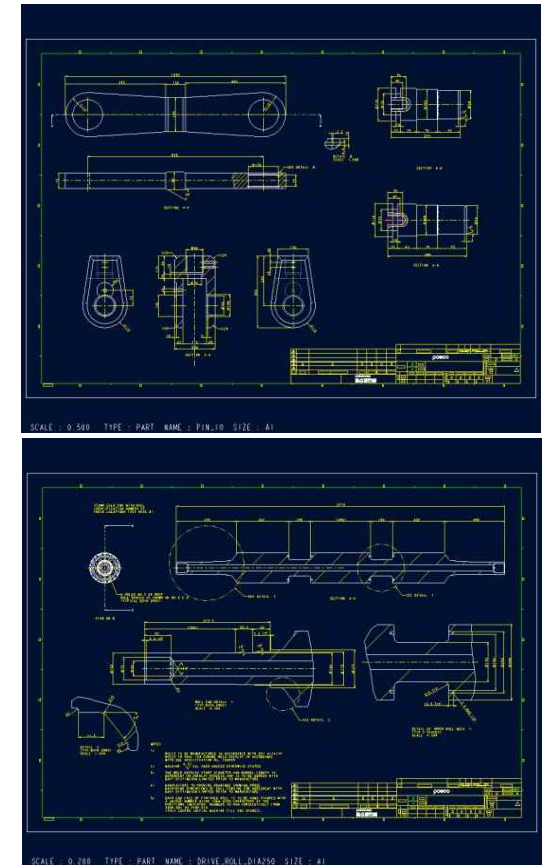
3D CAD Design



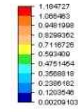
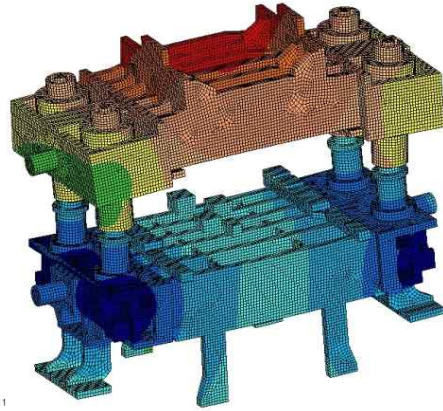
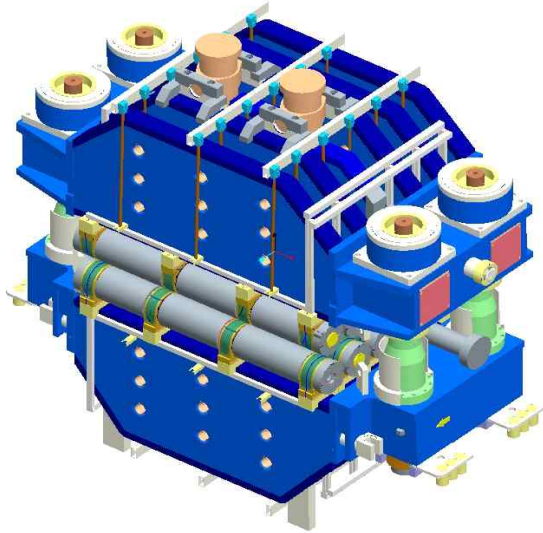
Motion & Structure Analysis



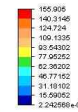
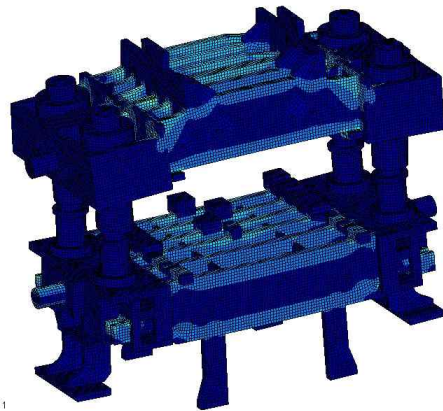
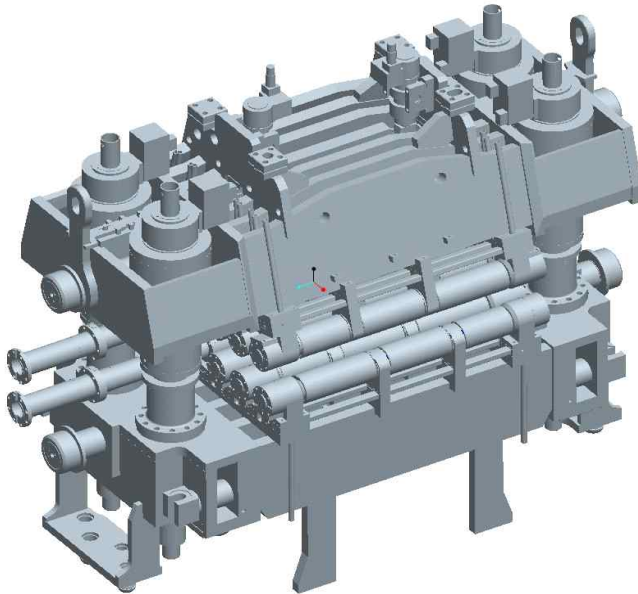
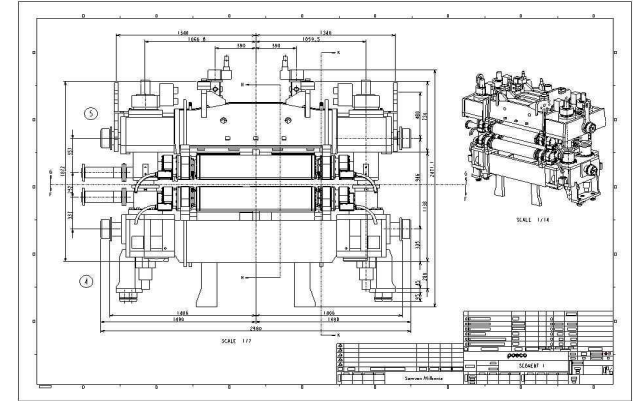
Drawing & BOM



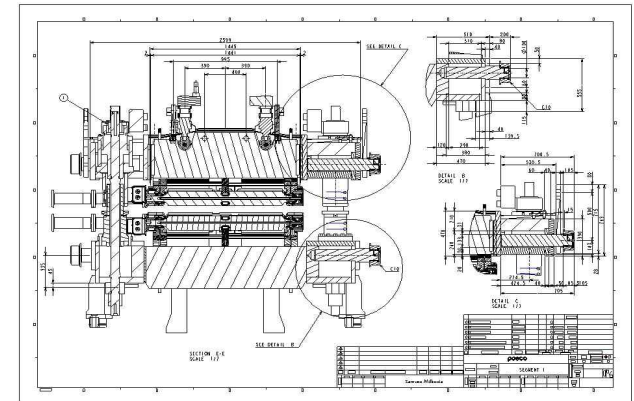
연주설비 설계 -Segment



Load Case: 1 of 1
 Maximum Value: 1.18473 mm
 Minimum Value: 0.00209103 mm

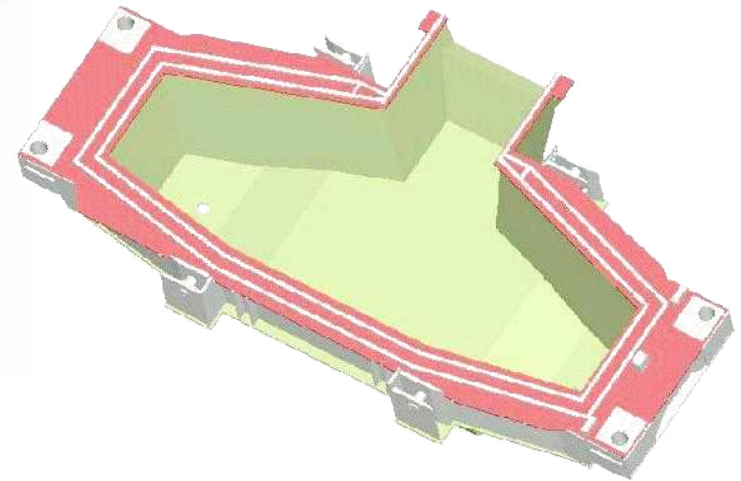
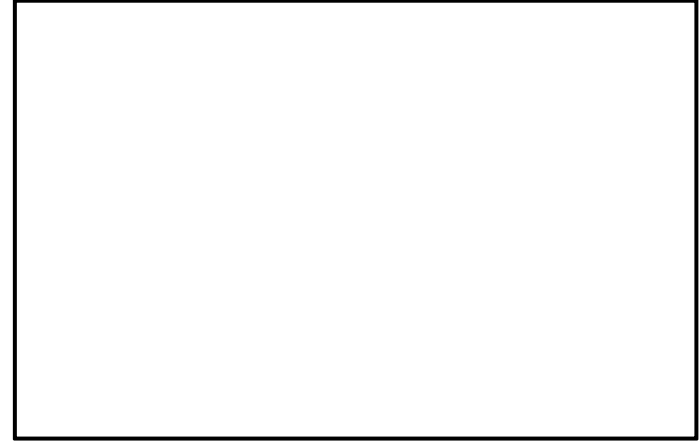
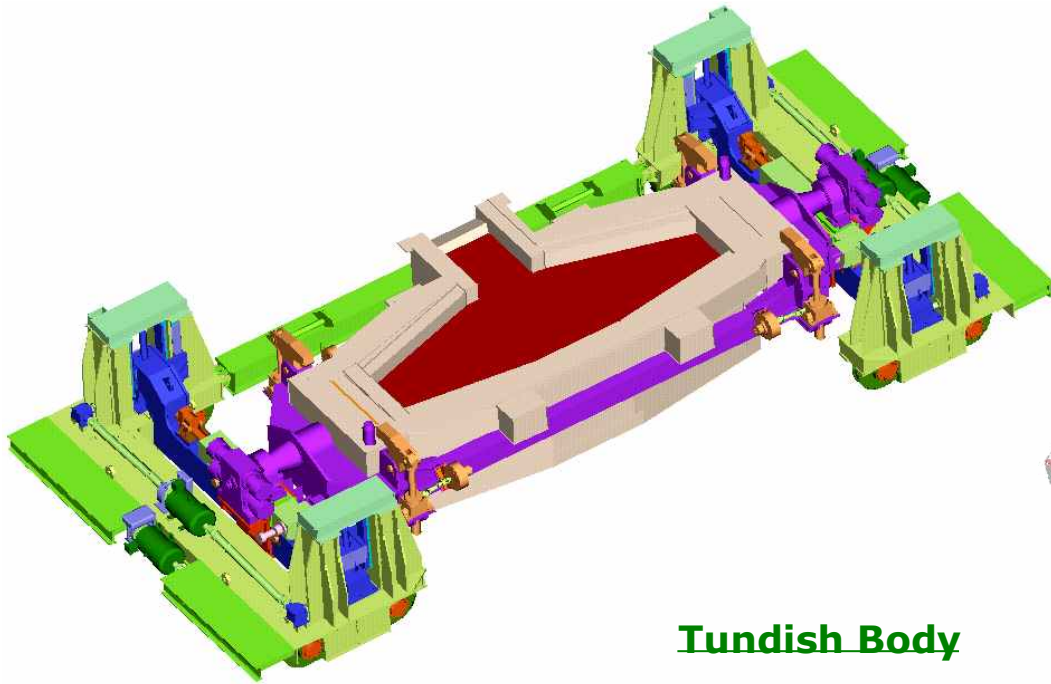


Load Case: 1 of 1
 Maximum Value: 155.905 N/(mm²)
 Minimum Value: 2.24257e-005 N/(mm²)



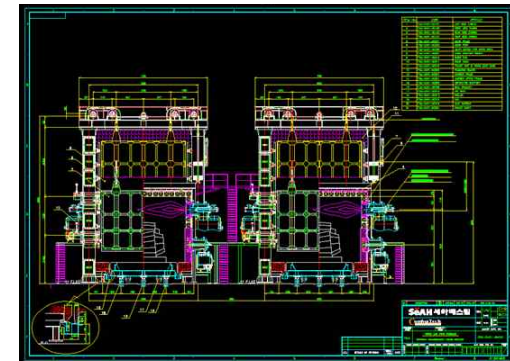
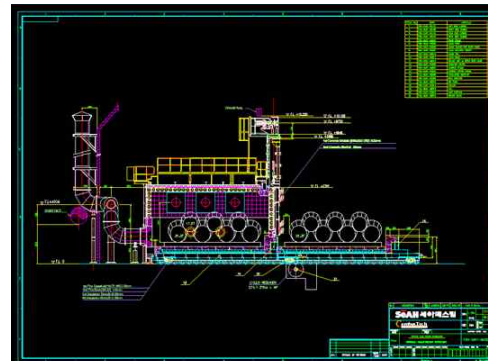
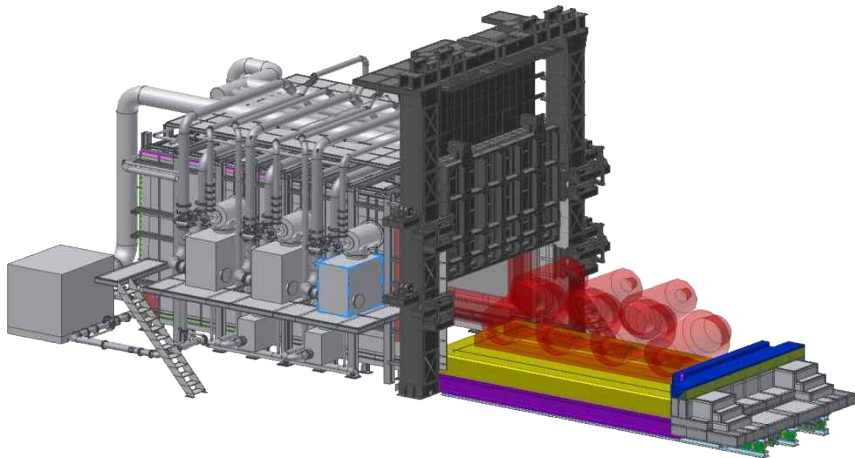
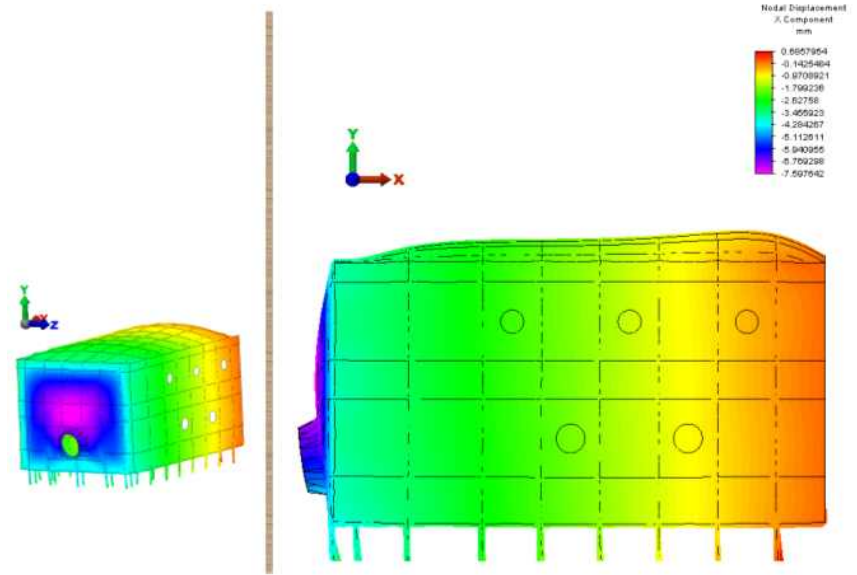
POSCO형 연주설비(국산화)

- 3D CAD & CAE를 이용한 설계 기술 개발
- 구조해석



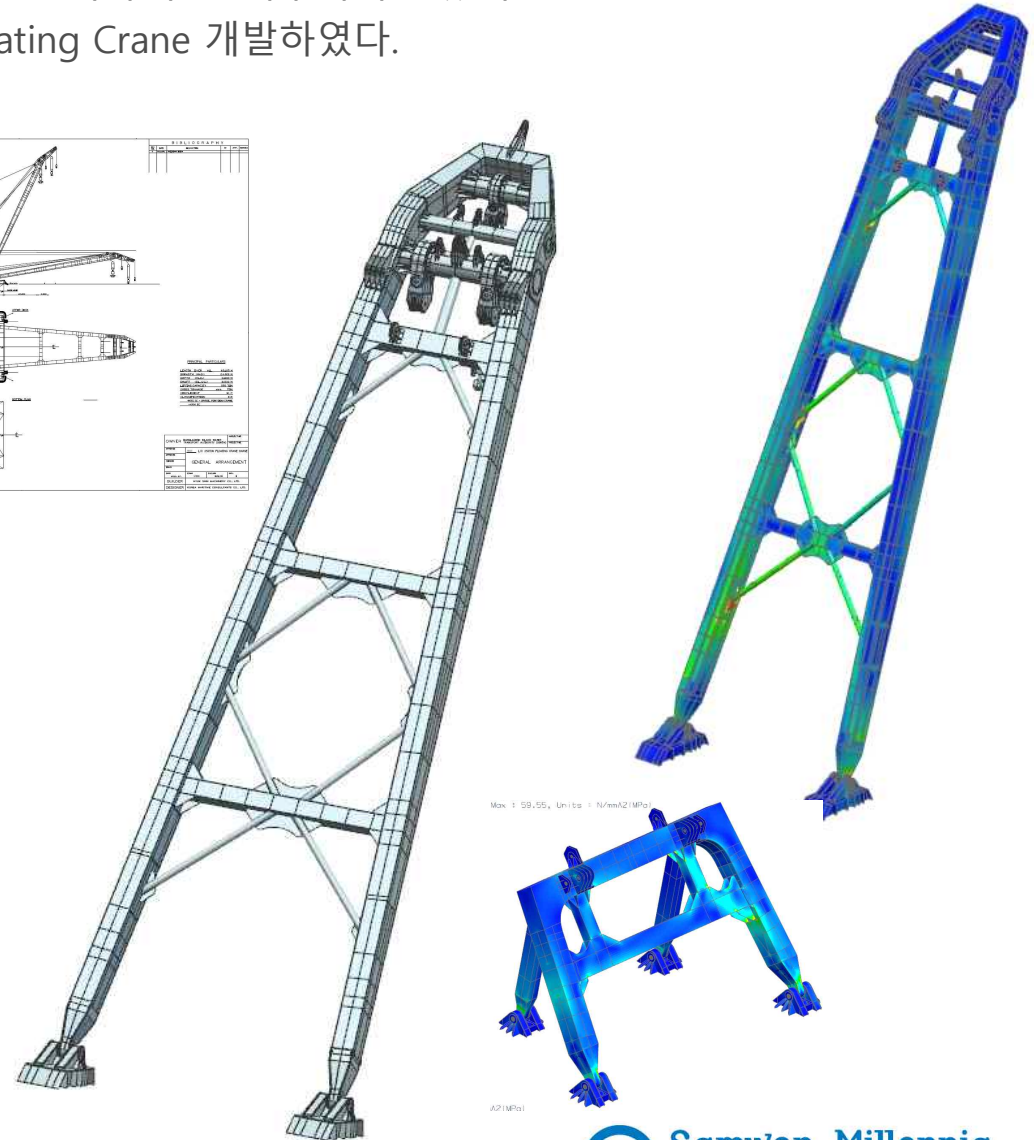
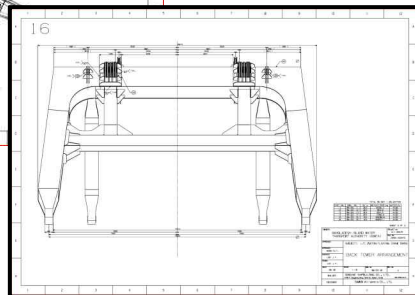
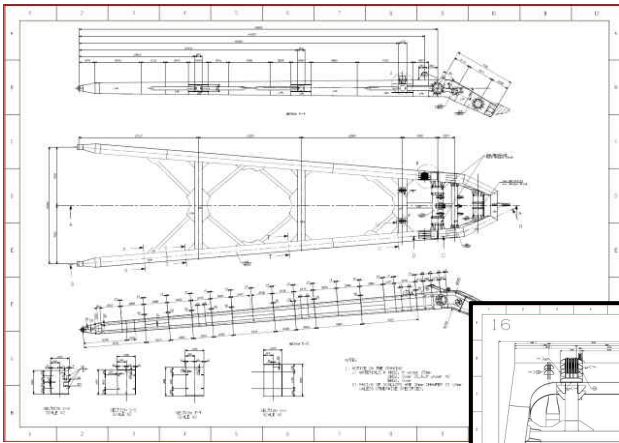
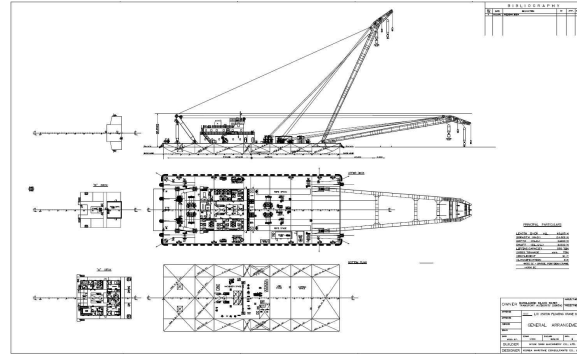
단조가열로 설계 국산화

- 연료비를 혁신한 단조가열로 설계 국산화



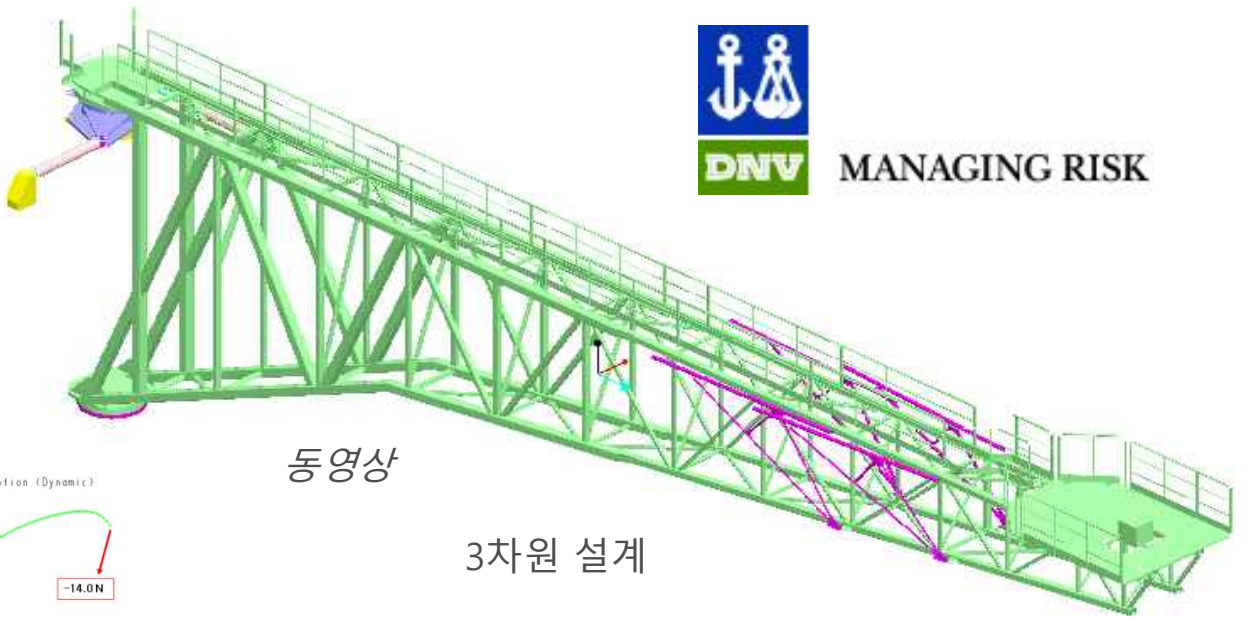
250ton Crane 개발

- 현재, 크레인 설계에 주로 2D 설계와 수 계산을 이용한 설계가 주로 이루어지고 있다.
- 3차원 설계와 해석 기술, 생산을 고려하여 250ton Floating Crane 개발하였다.



Burner Boom 개발

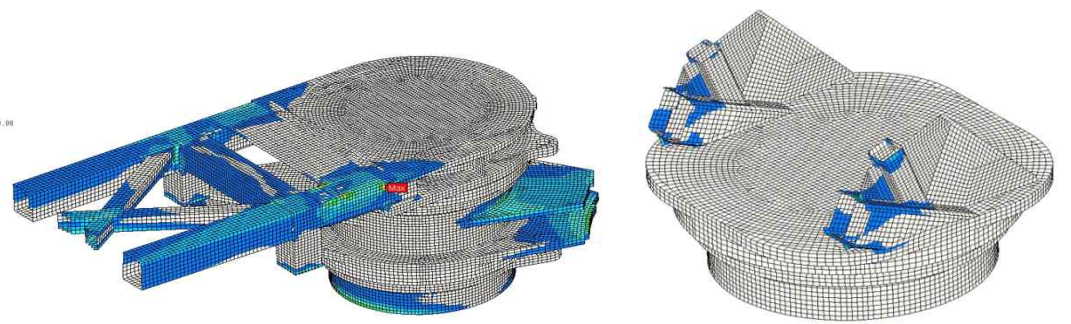
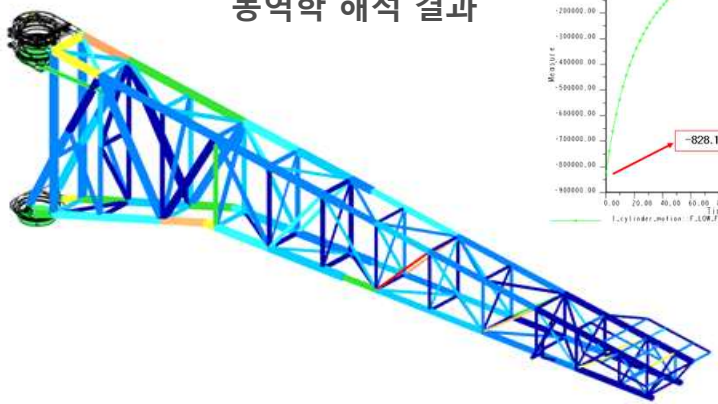
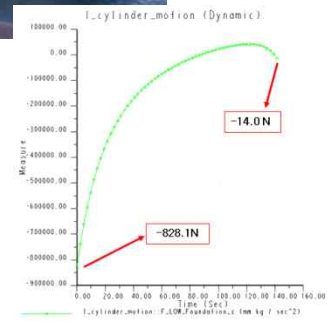
- 3D CAD 및 CAE 기술을 활용한 Burner Boom 기본 및 생산설계



동영상

3차원 설계

동역학 해석 결과

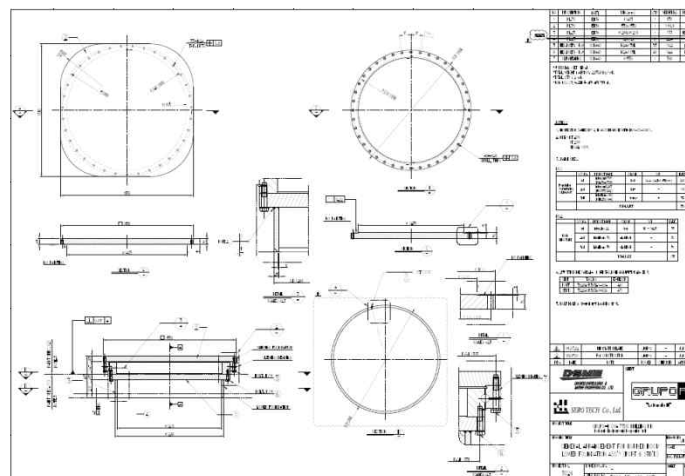
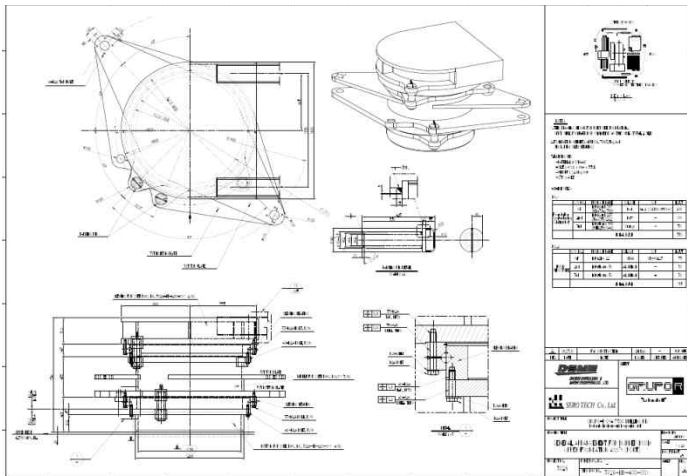
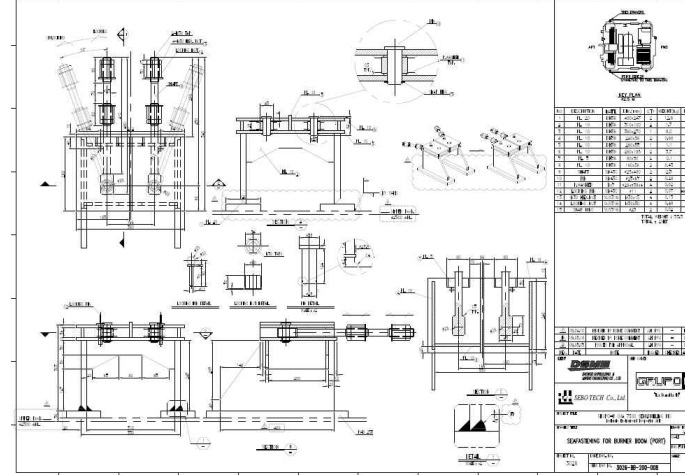
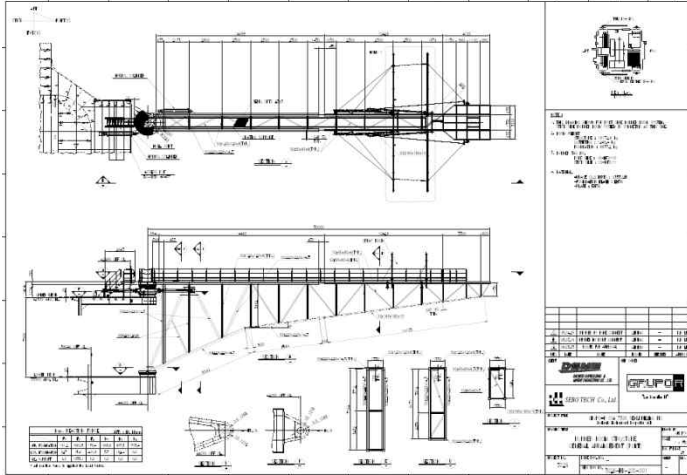


Beam 구조 해석 및 AISC Code Check결과

국부해석 결과

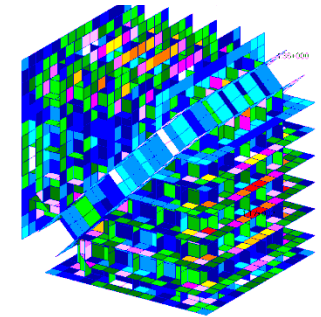
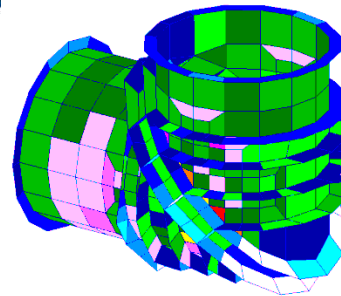
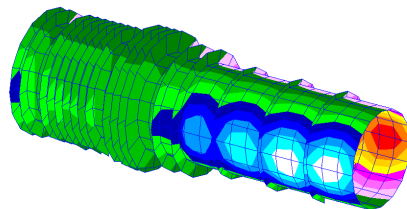
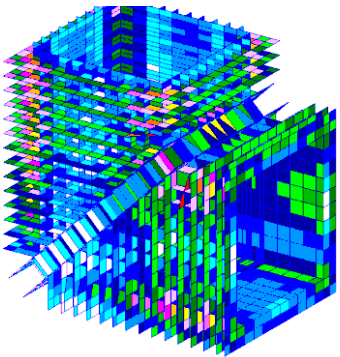
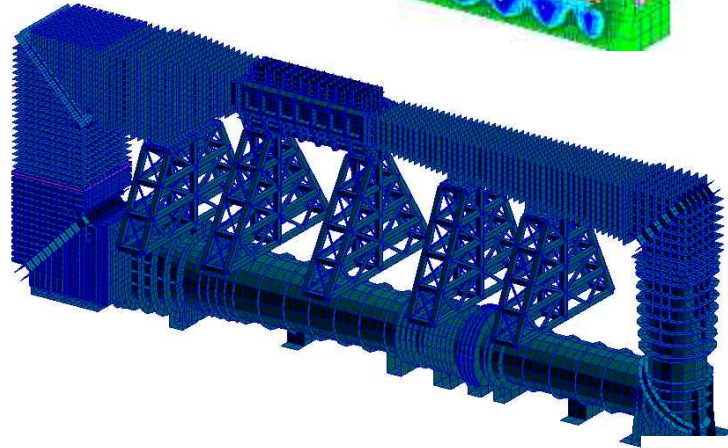
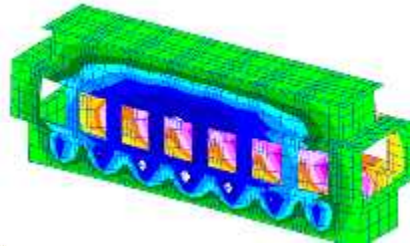
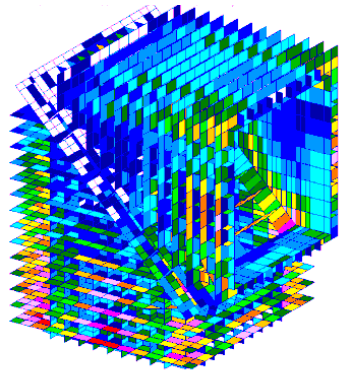
Burner Boom 개발

- 3D CAD 및 CAE 기술을 활용한 Burner Boom 기본 및 생산설계



대형 Cavitation Tunnel 기본 설계/구조/진동해석

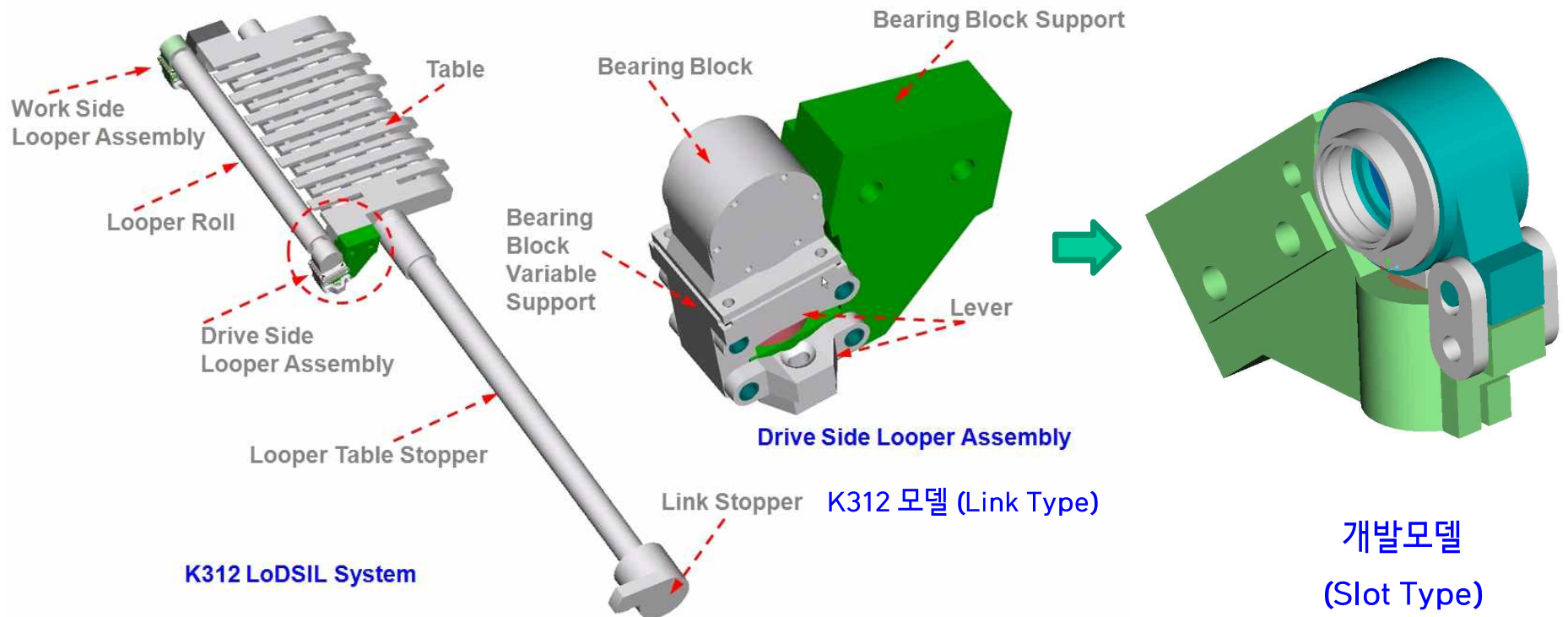
- 저소음 대형 케비테이션 터널은 상선 및 특수선의 케비테이션 및 각종 유체시험, 소음계측 및 각종 수중 음향시험에 사용되며, 선박 개발에 활용된다.
- 국내 기술로 개발된 최초의 초대형 케비테이션 터널(길이 60m, 높이 22.5m, 폭 6.5m) 이며, 선박과 함정의 성능시험이 국내서도 가능하게 되었다.



©
M&S
P&S

LoDSIL 최적설계

- 목적 : K312 LoDSIL 시스템의 열간 사상 압연 공정 중에 발생하는 정하중 조건과 정비 완료 후 원위치로 되돌릴 때 발생하는 충격 하중 조건에 대하여 LoDSIL 시스템의 구조 강도를 평가하고, 개선된 효율적인 모델 설계에 있다.

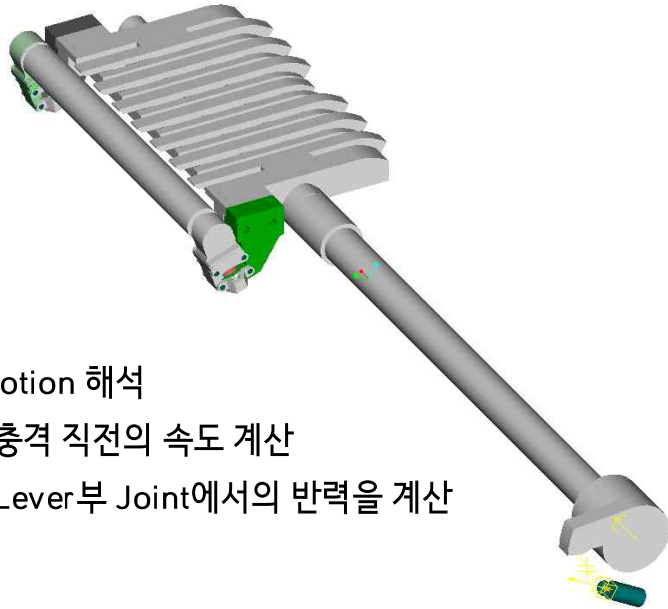


LoDSIL 최적설계 - 기존모델해석

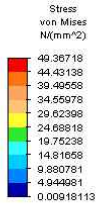
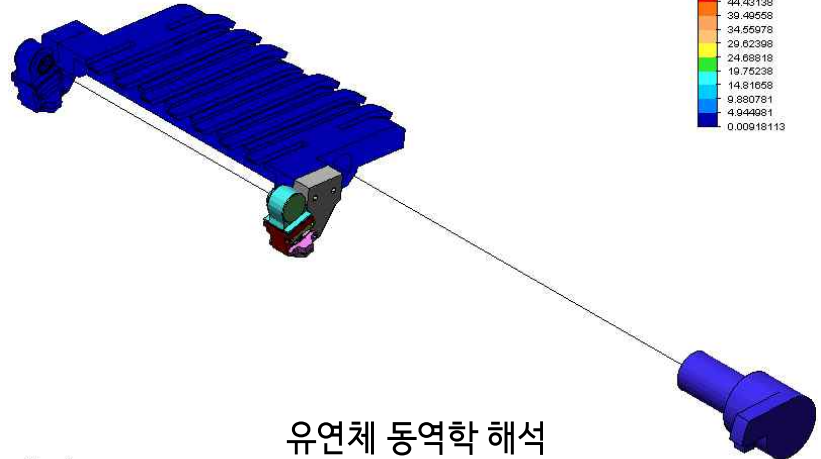
Motion 해석

-충격 직전의 속도 계산

-Lever부 Joint에서의 반력을 계산



ALGOR
Superview



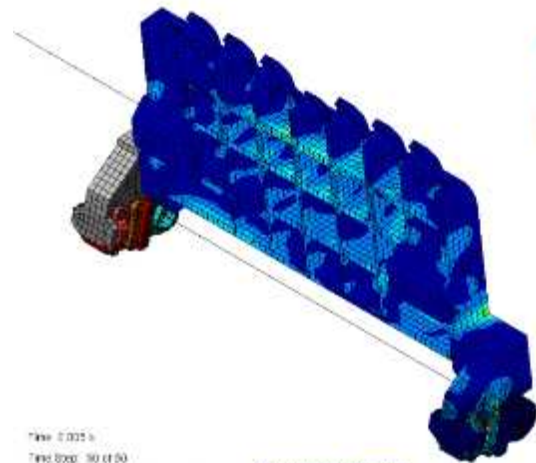
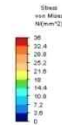
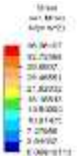
Time: 0 s

Time Step: 0 of 50

Maximum Value: 0 N/(mm²)

Minimum Value: 0 N/(mm²)

유연체 동역학 해석



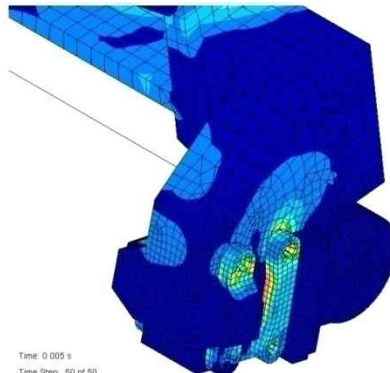
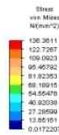
Time: 0.005 s

Time Step: 50 of 50

Maximum Value: 136.361 N/(mm²)

Minimum Value: 0.00918113 N/(mm²)

Von-mises Stress



Time: 0.005 s

Time Step: 50 of 50

Maximum Value: 136.361 N/(mm²)

Minimum Value: 0.00918113 N/(mm²)

Von-mises Stress



Time: 0.005 s

Time Step: 50 of 50

Maximum Value: 136.361 N/(mm²)

Minimum Value: 0.0172207 N/(mm²)

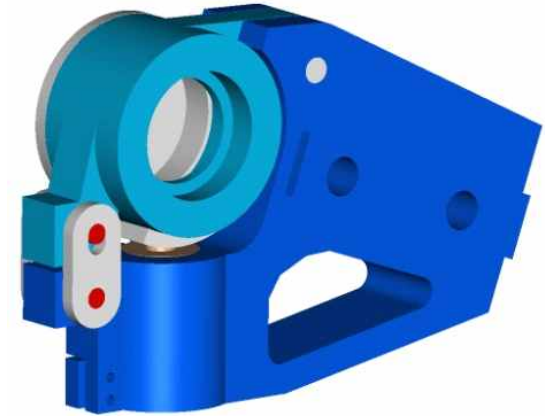
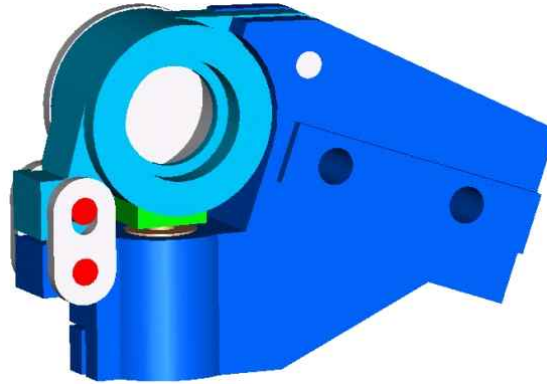
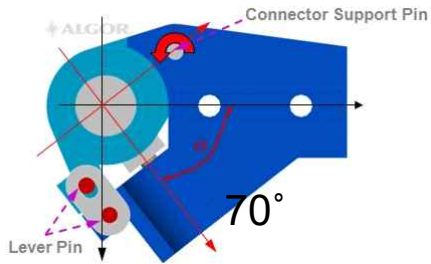
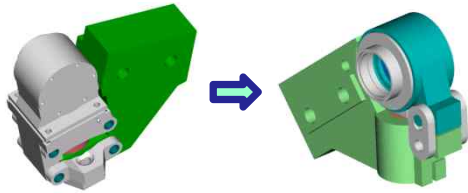
Von-mises Stress



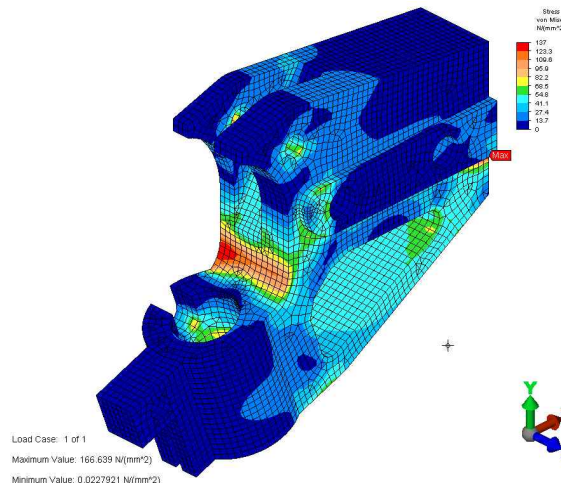
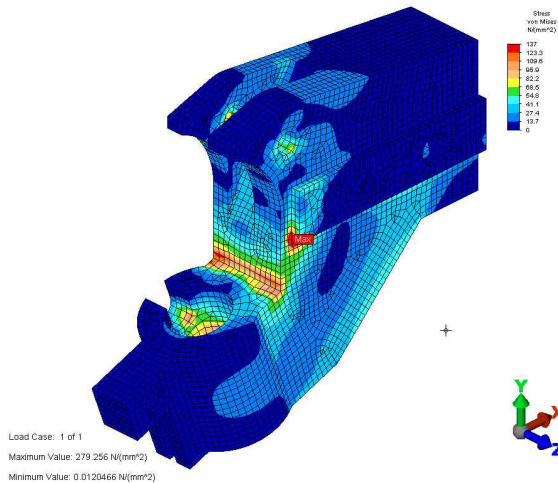
Samwon Millennium

(주)삼원밀레니얼

LoDSIL 최적설계 – Bearing Block Support 형상 최적화



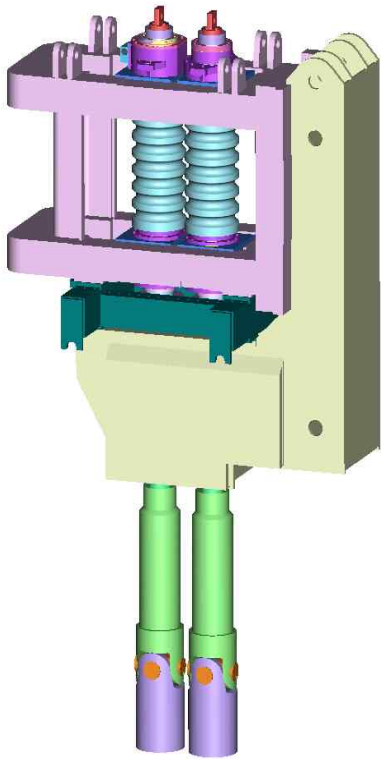
최적화 모델



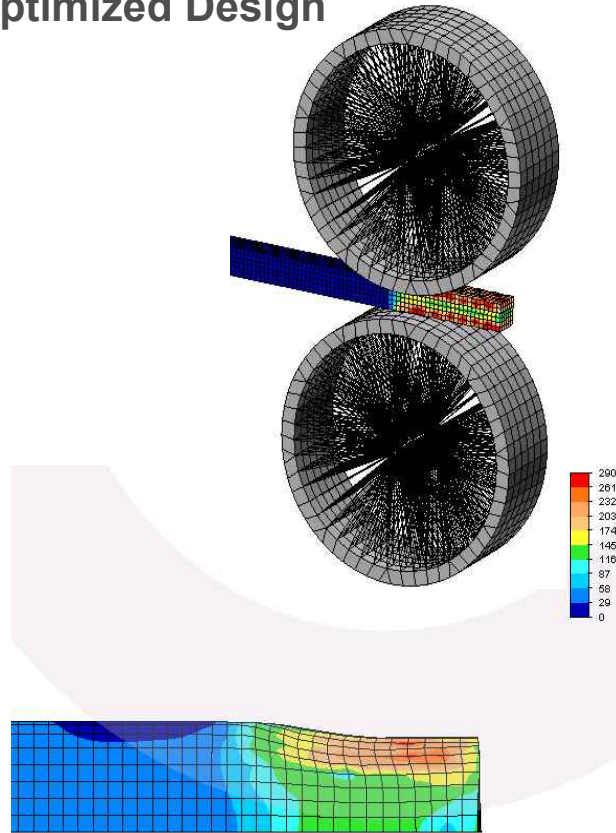
2선재공장 조압연 Mill 베어링 파손원인분석

- 목적 : 선재용 조압연기의 작업 중 베어링 파손 문제의 원인 규명

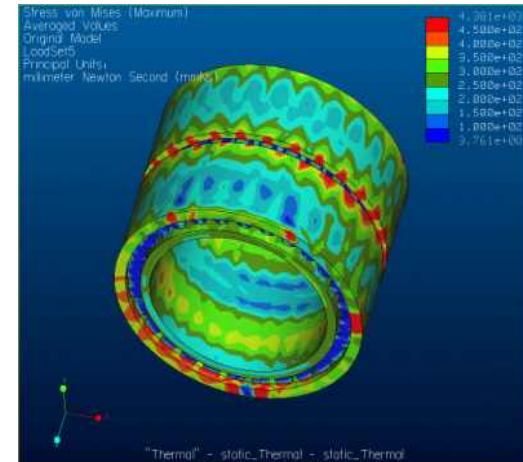
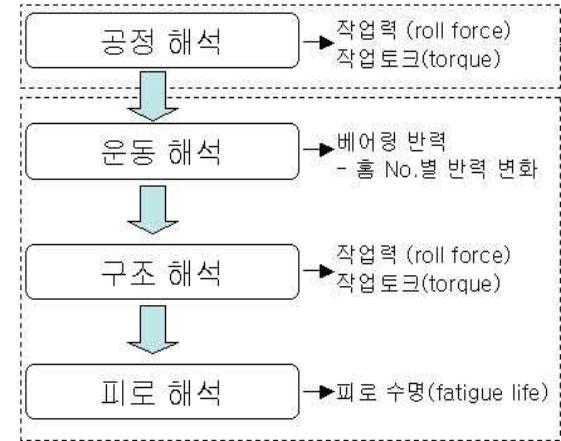
- ▶ Determination of Rolling Force through MES
- ▶ Failure Analysis of Roller Bearing
- ▶ Suggestion of Final Optimized Design



3D CAD Model



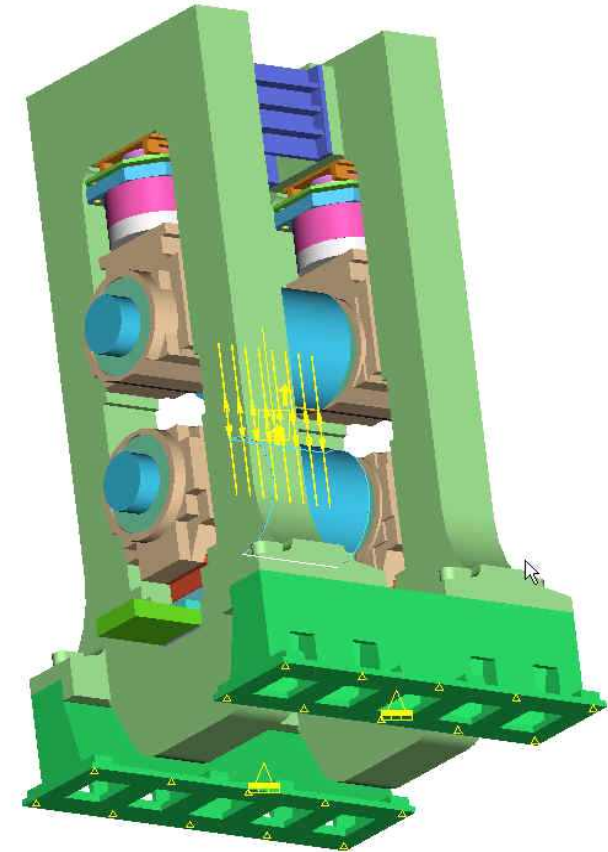
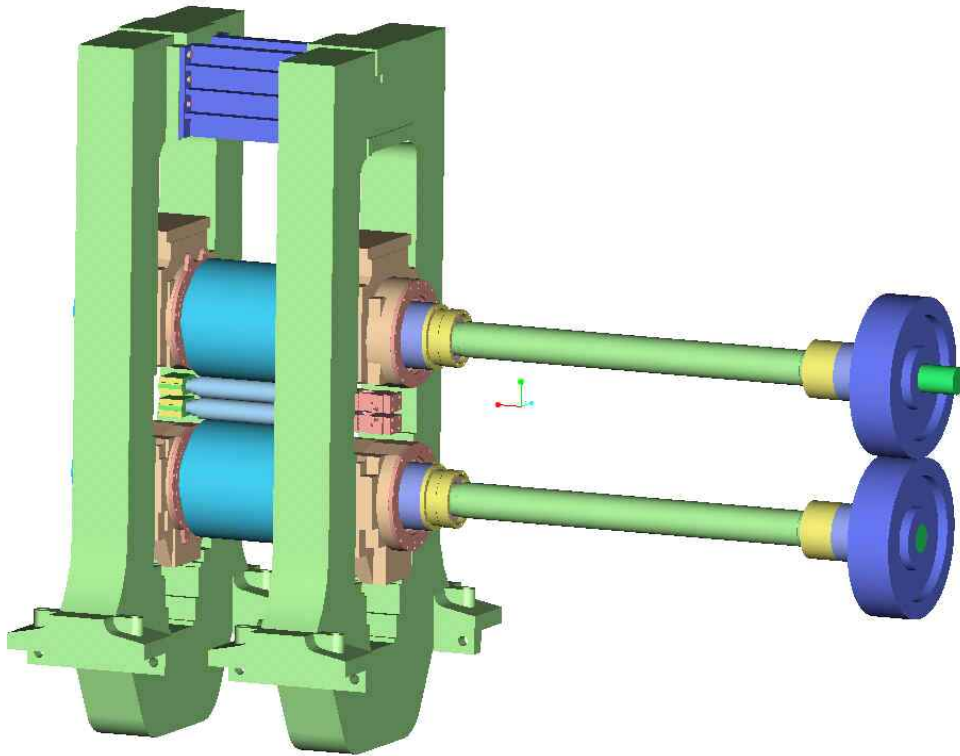
MES(Flexible Body Analysis)



결과분석 및 개선안 도출

전기강판 CVC MILL 모델링 및 해석

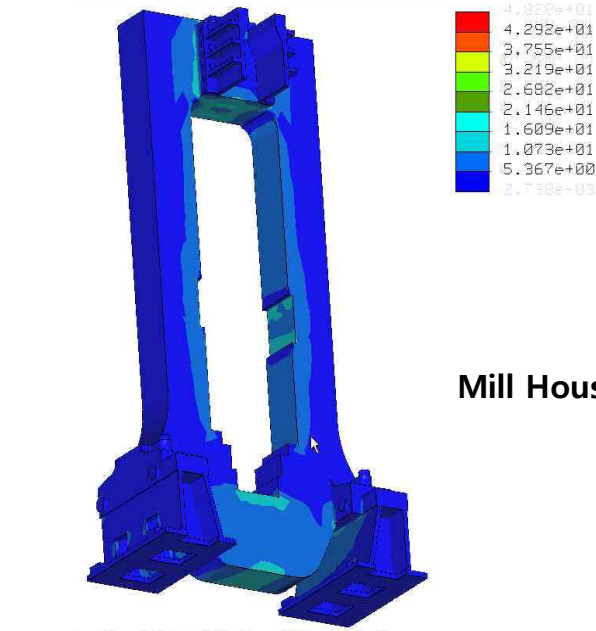
- 목적 : 전기강판 CVC MILL의 삼차원 모델 구축 및 구조적 안전성 검토



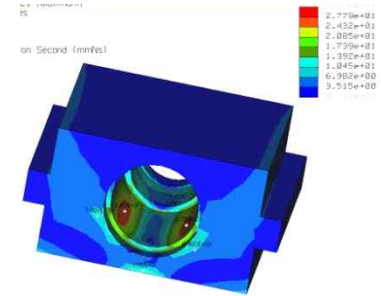
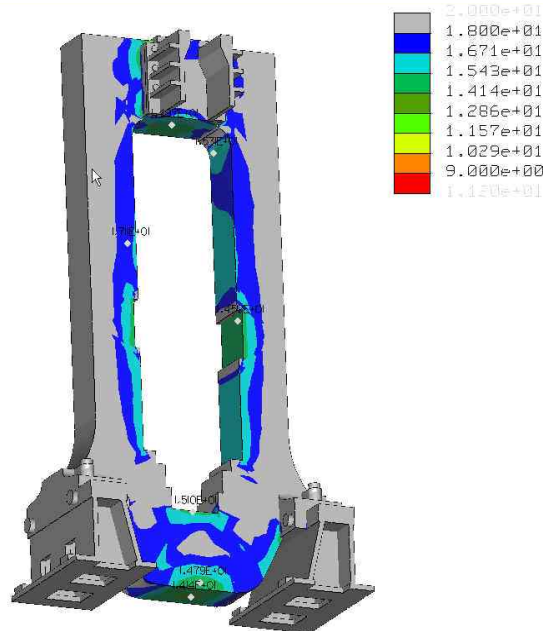
3차원 모델

전기강판 CVC MILL 모델링 및 해석(계속)

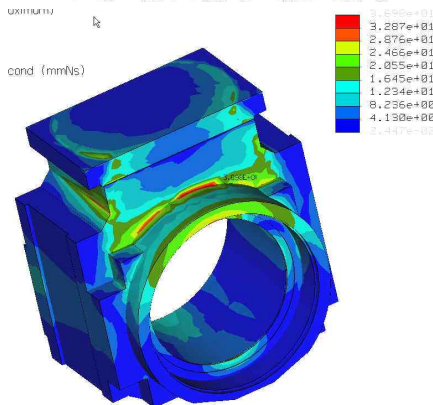
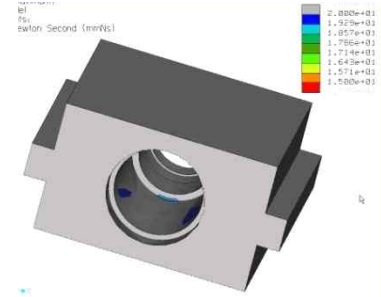
● 구조/피로해석



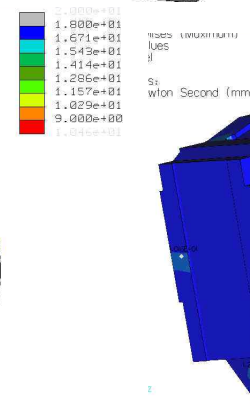
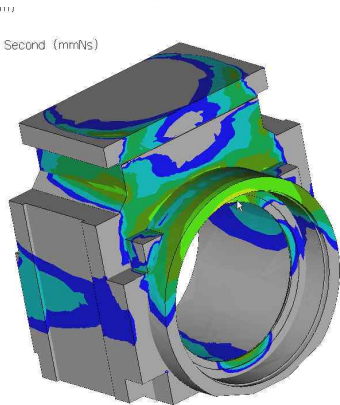
Mill Housing



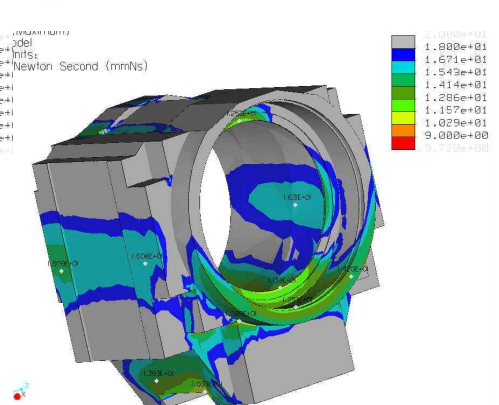
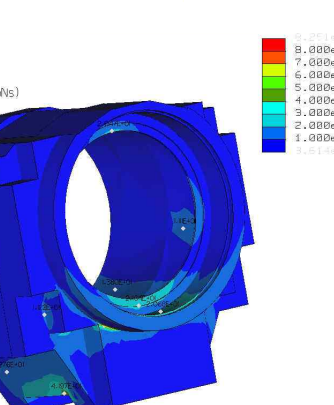
Work Roll Chock



Backup Roll Chock - Up



Backup Roll Chock - Down



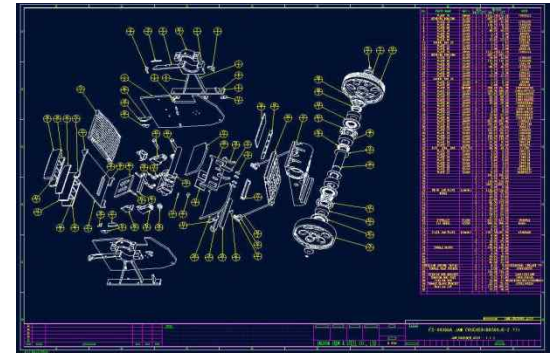
파쇄기(JAW Crusher) 개발

- 외국 도면을 수입하여 국내에서 제작하는 제품의 설계 국산화를 통하여 독자 설계 기술 확보, 연간 10억 절감의 효과를 거두었다.

3D CAD 설계

동역학 및 구조해석

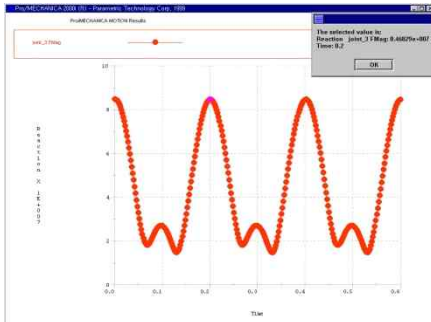
도면 & BOM



년 10억 절감
독자 설계

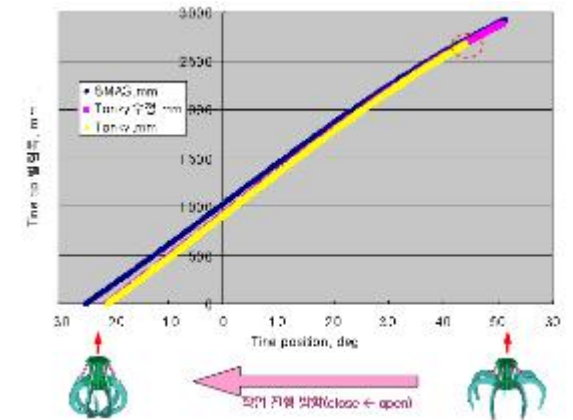
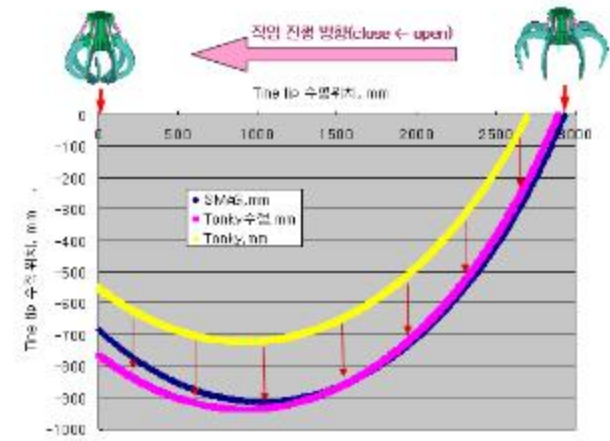
파쇄기(Jaw Crusher) 개발

- 동 시 공 학
- 설계 자료 확보

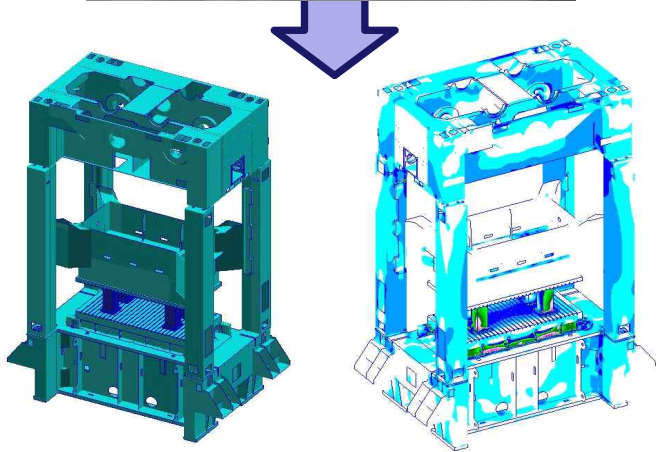


Grab 개발

- Grab 작업 성능에 영향을 주는 인자를 찾고 작업 성능이 개선된 새로운 모델의 개발
- 이를 위하여 3차원 설계 및 동역학 해석 기술을 이용하였다

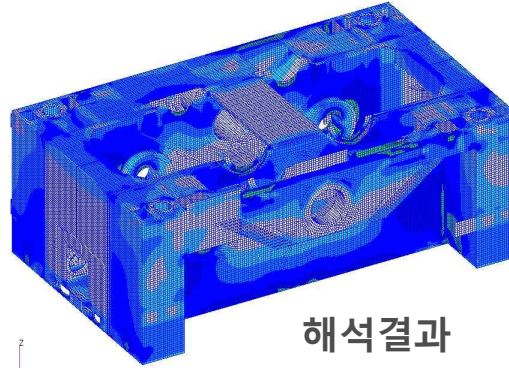


2400톤 프레스 해석 프로세스 정립

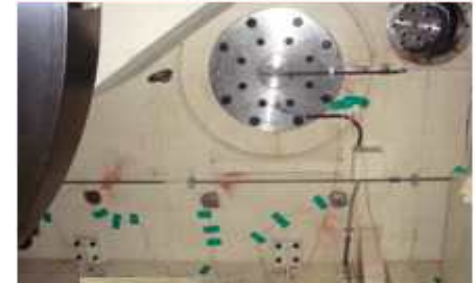


3D model

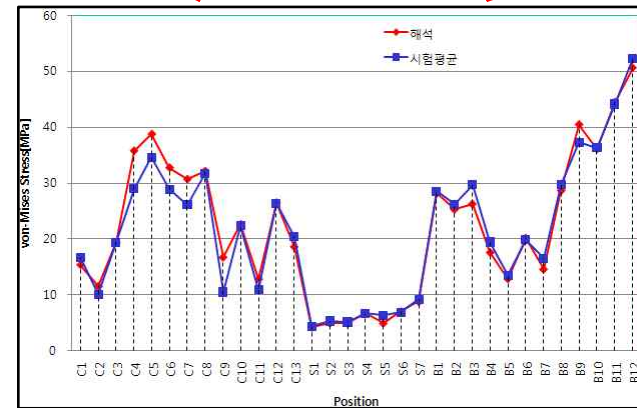
구조해석



해석결과



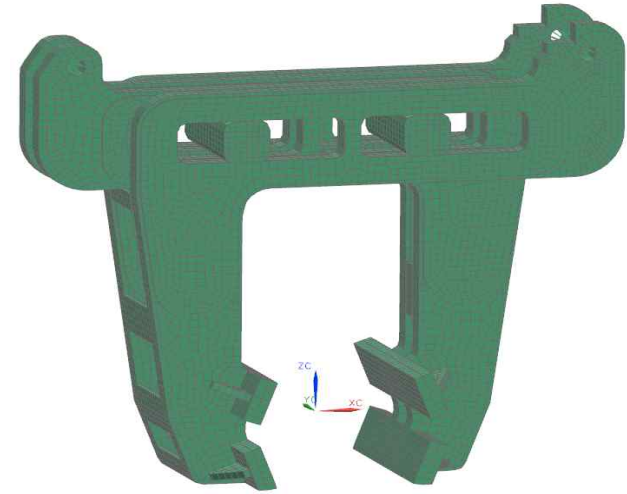
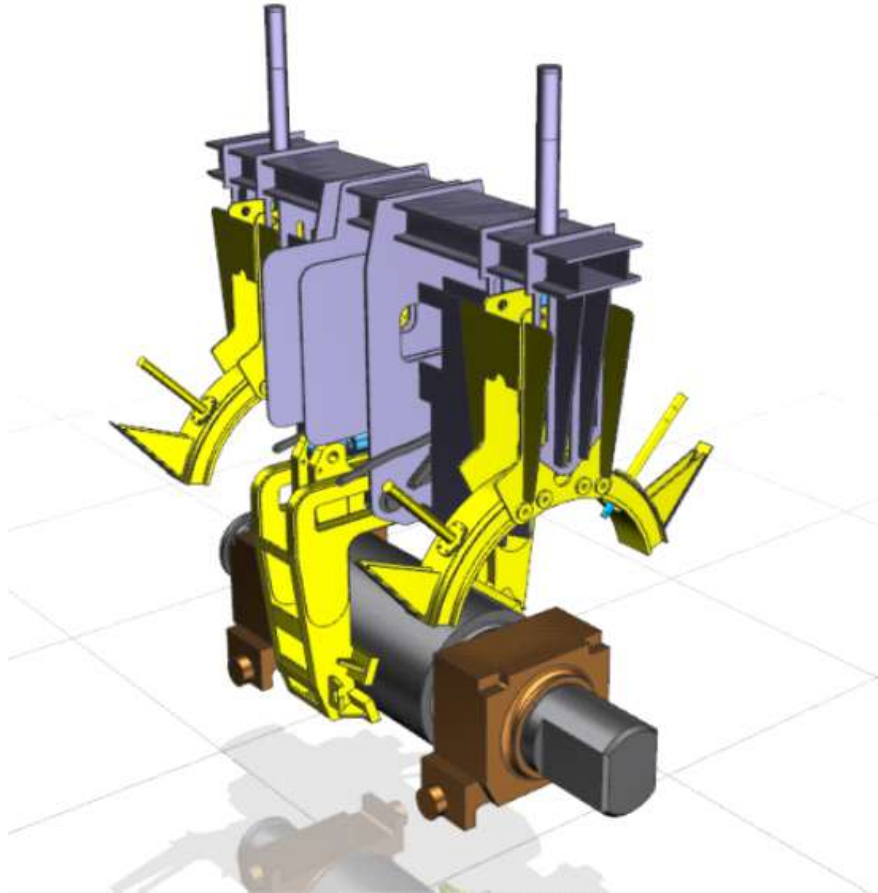
시험결과



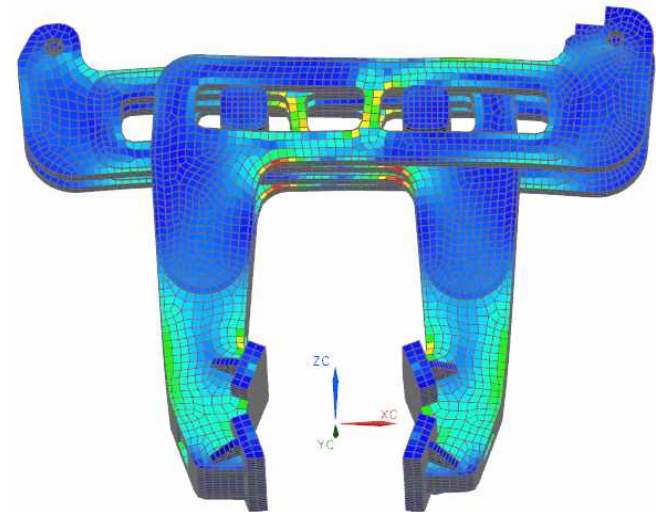
- 회귀분석을 통하여 해석 결과와 시험 결과의 오차를 검토
- 하중입력 방식 및 구속조건 입력 방식에 대한 구조해석 신뢰성 검증
- 해석기법 정립

60TON ROLL TONGS

- 60ton work roll tongs의 구조적 안전성 검토 및 작동성 검토



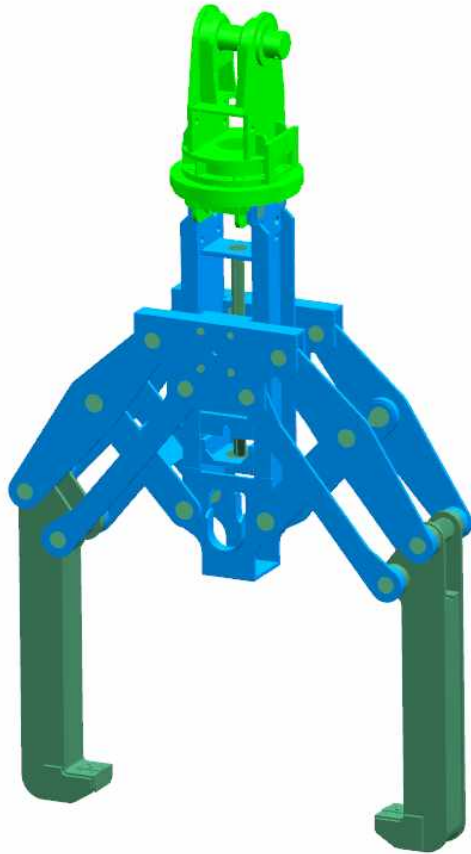
해석 모델



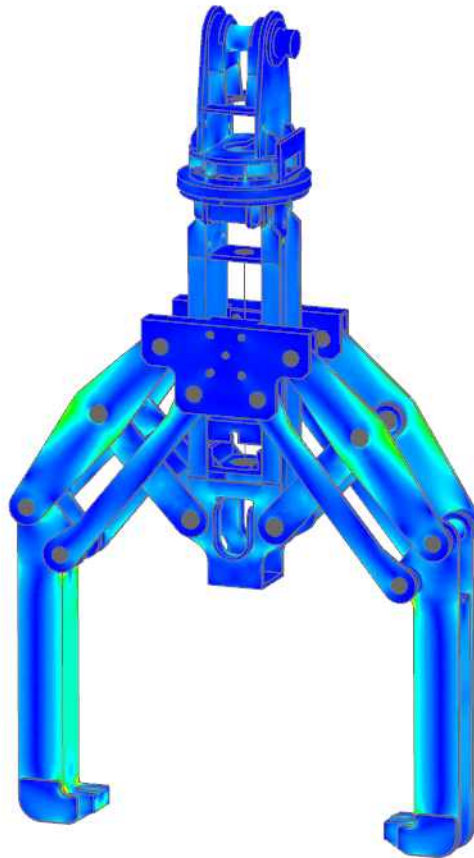
해석 결과

40TON Coil Lifter 구조안전성 검토

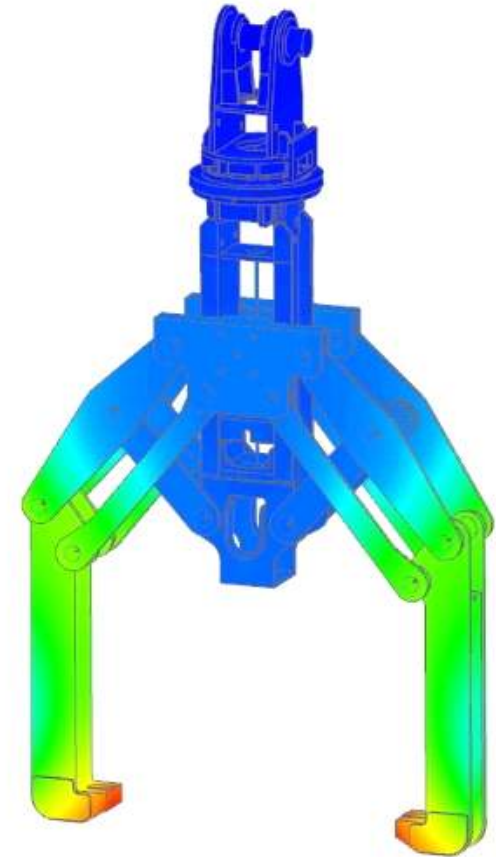
- 40ton Coil Lifter의 사용하중 조건에 대한 구조적 안전성을 검토하기 위하여 구조해석을 수행하였다.



해석 모델



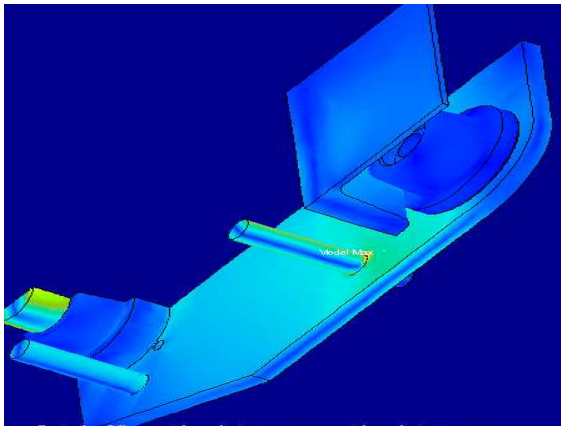
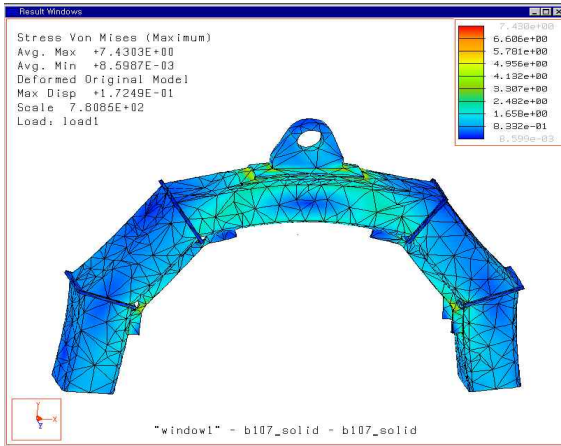
해석 결과-응력분포



해석 결과-변위

이동식 점검차

- 3D CAD & CAE를 이용하여 이동식 점검차(방화대교)를 설계(국산화)



구동 부품 설계

- 구조물의 안정성 평가
- 설계 자료 확보

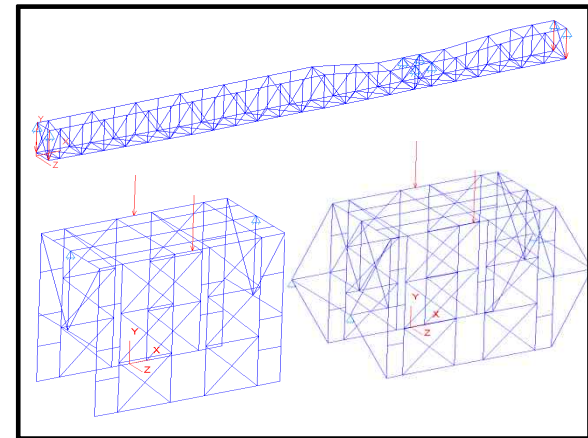
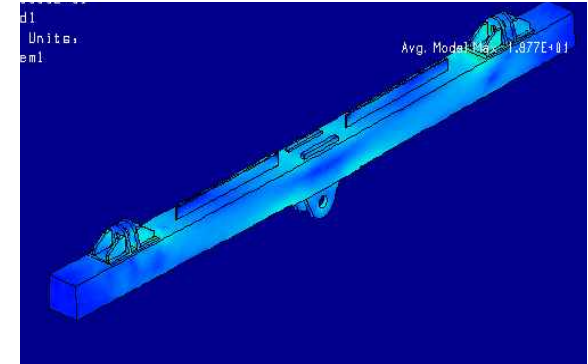


독자 설계
원가 절감



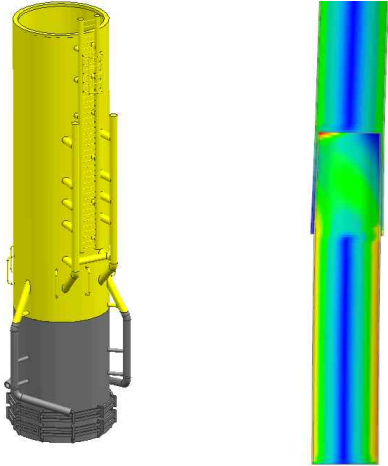
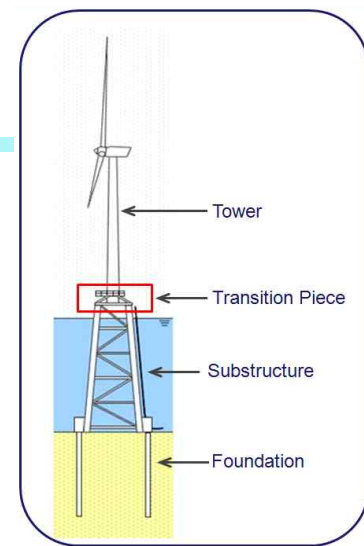
철강재 구조물 평가

- 구조물의 안정성 평가
- 설계 자료 확보

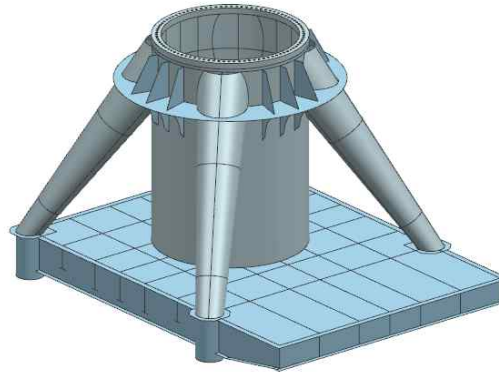


5MW 해상 풍력 발전기 Transition Piece 개발

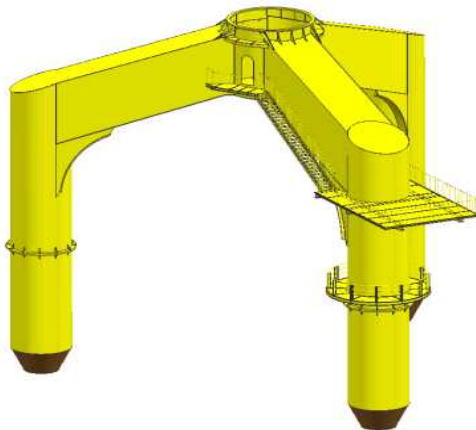
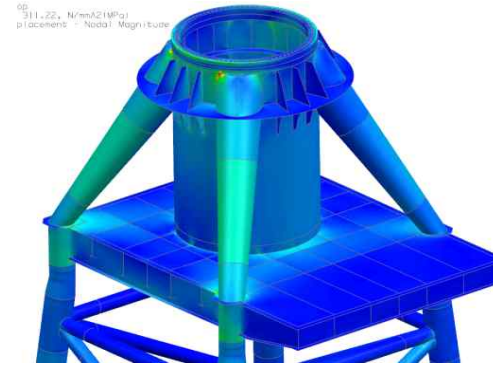
- 목적 : 5MW 해상 풍력 발전기용 Transition Piece 설계 및 경제성 분석
 - Monopile Type, Jacket Type, Tripile Type, Dolphin Type



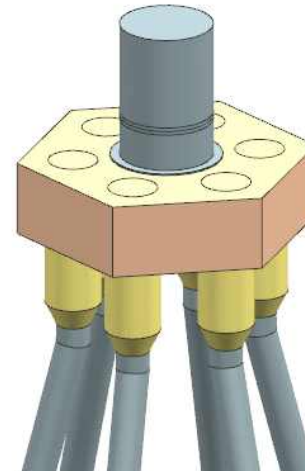
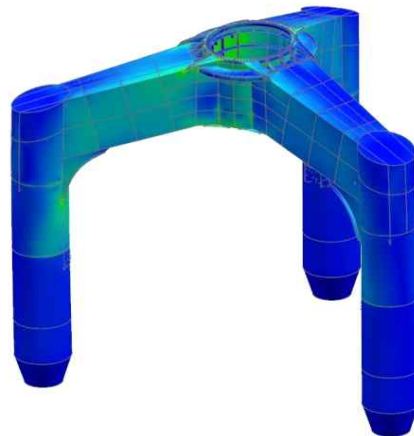
Monopile type



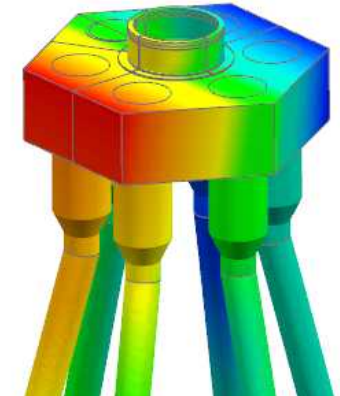
Jacket type



Tripile type



Dolphin type

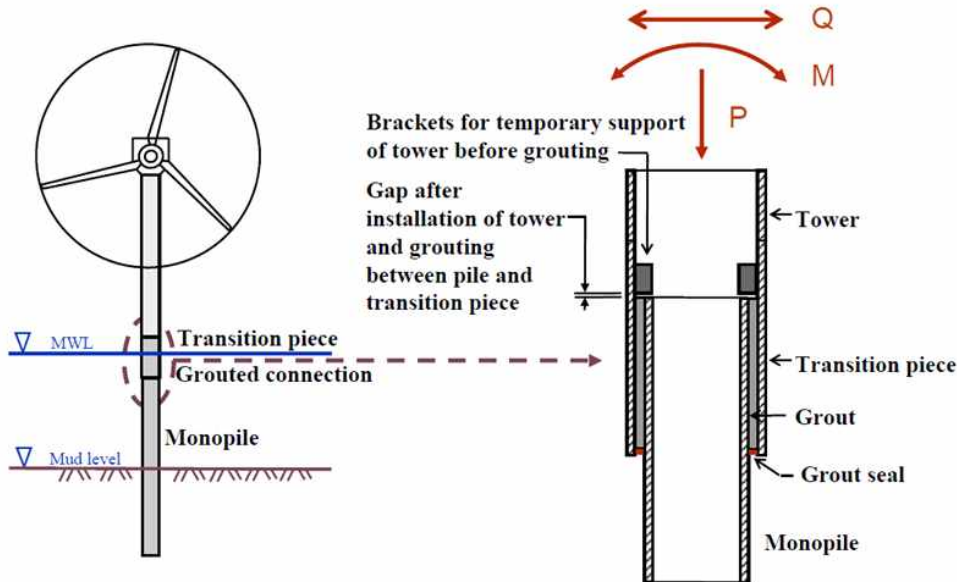
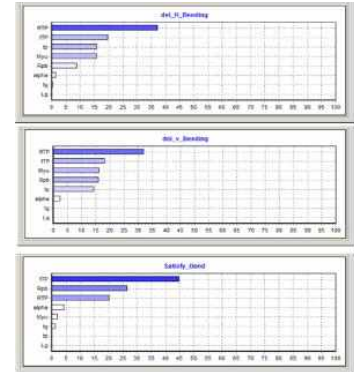
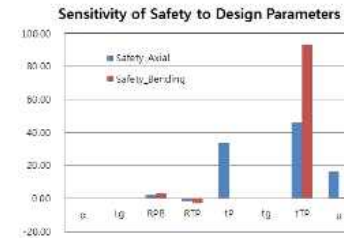


5MW 해상 풍력 발전기 Transition Piece 개발

- 최적설계 기법을 적용하므로 중량이 감소한 강건한 제품을 설계할 수 있으며, Monopile Type과 Jacket Type에 적용한 사례이다.

❖ Monopile Type Transition Piece

- 설계 민감도 해석 및 최적 설계 기법 적용 :
 - 민감도 - Individual Input Parameters
 - ✓ - 실험계획법



Grouted connection in monopile structure

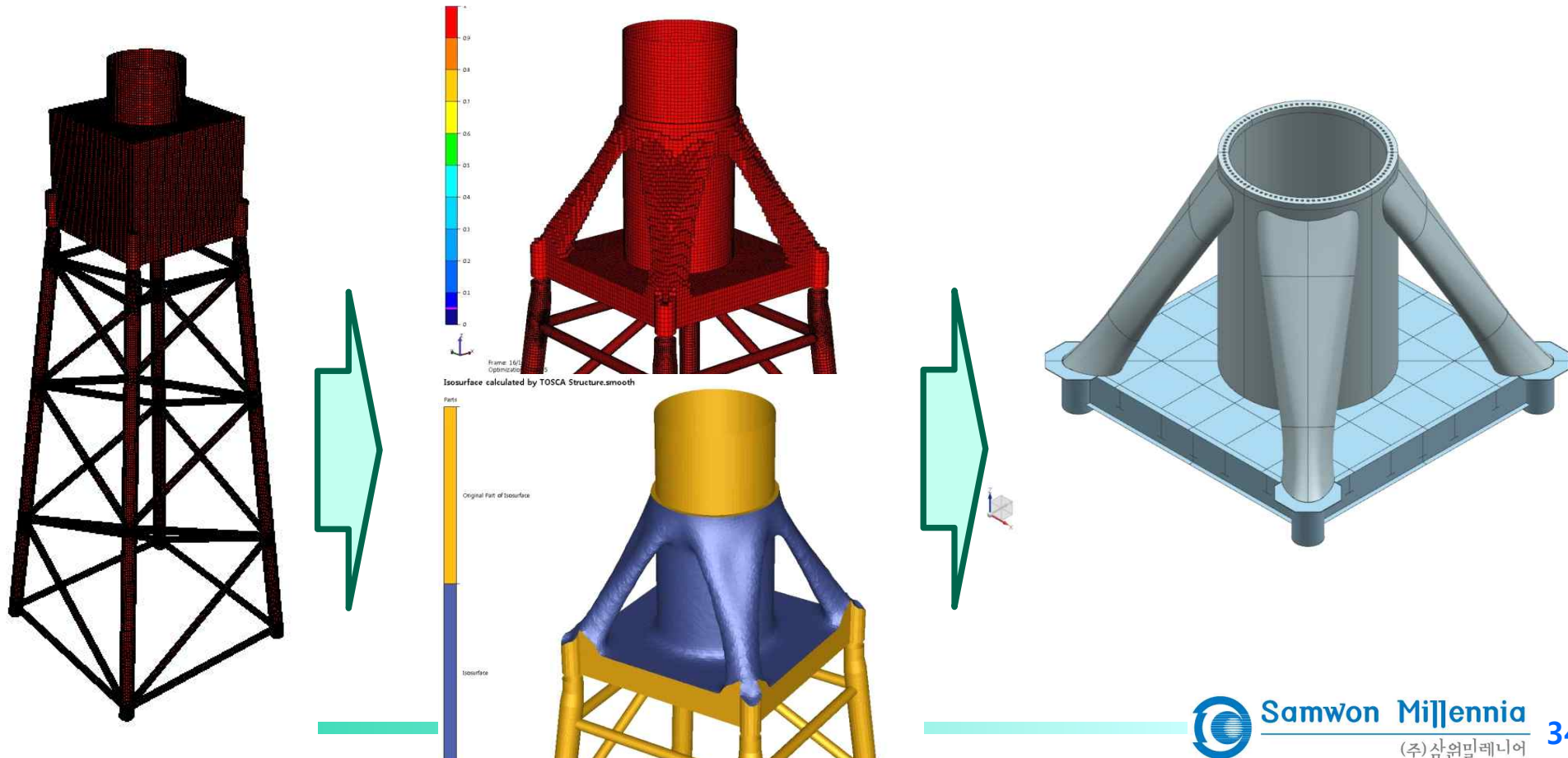
목적함수 : Minimize Mass of monopile
 설계 변수 : α , R_{pb} , t_p , t_{TP}
 제한조건 : Safety for Axial Capacity(SAC)
 : $30 < SAC(\%) < 60$
 Safety for Bending moment Capacity(SBC)
 : $25 < SBC(\%) < 60$
 $1 < \alpha(\text{deg}) < 2$, $2 < R_{pb}(\text{m}) < 3$, $0.05 < t_p(\text{m}) < 0.09$,
 $0.05 < t_{TP}(\text{m}) < 0.08$

Parameters		Initial(%)	Optimal(%)	
Design Variables	α	deg	100	0.0
	R_{pb}	m	100	-2.9
	t_p	m	100	-21.9
	t_{TP}	m	100	0.0
Objective Functions	M_{pile}	ton	100	-24.2
	M_{grout}	ton	100	-3.0
	M_{tp}	ton	100	-3.0
Constraints	Satisfy_Axial	%	100	-23.4
	Satisfy_Bend	%	100	-10.0

5MW 해상 풍력 발전기 Transition Piece 개발

❖ Jacket Type Transition Piece

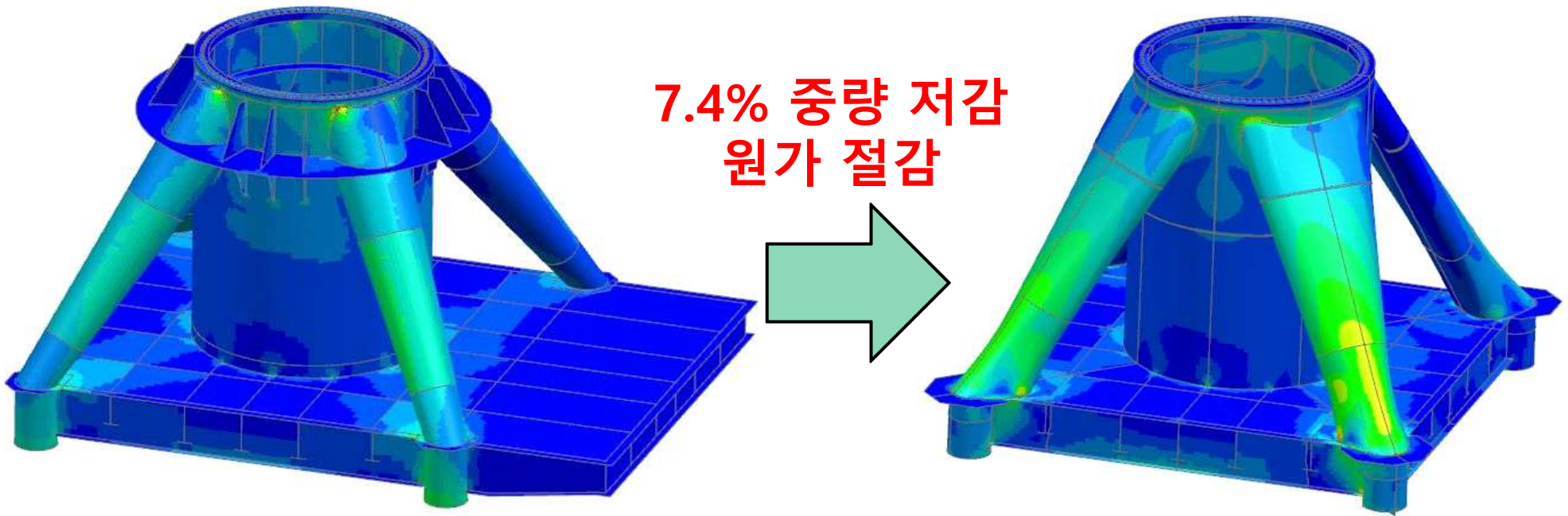
- 위상 최적화 및 형상 최적화 기법 적용
 - ✓ 위상 최적화 기법 : 초기 형상 설계(기본 설계)
 - ✓ 형상 최적화 기법 : 국부적인 응력 감소 -> 피로 수명 증가



5MW 해상 풍력 발전기 Transition Piece 개발

❖ Jacket Type Transition Piece

- 기존의 방법으로 설계한 것과 최적화 기법을 이용하여 설계한 것의 응력 분포는 아래와 같으며 **중량은 7.4% 감소** 하였다.

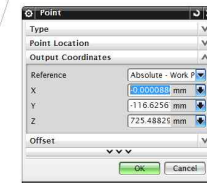
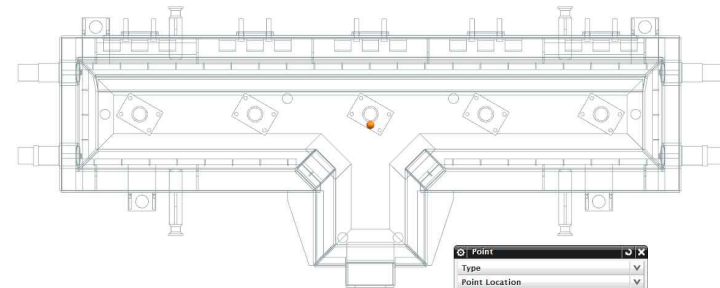
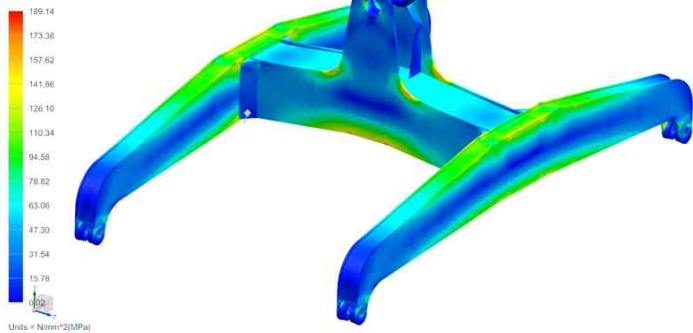
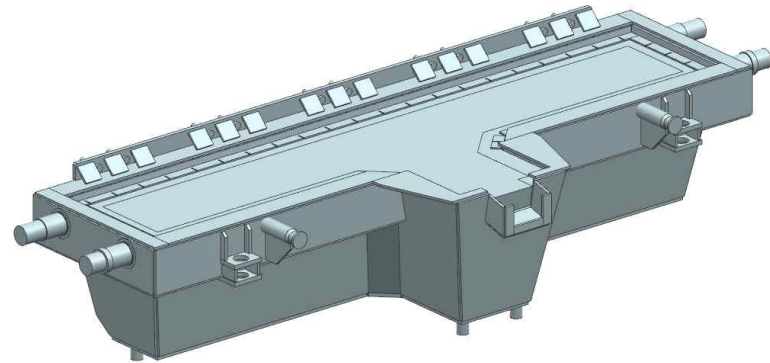
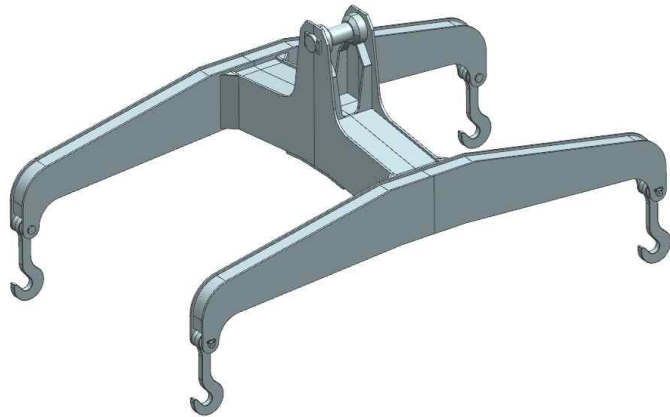


(a) 기존 설계 방법을 이용한 Transition Piece

(b) 최적 설계 방법을 이용한 Transition Piece

80ton/100ton TUNDISH HANGER 구조해석 및 무게중심 계산

- 80ton/100ton TUNDISH HANGER 구조적 안전성을 검토하기 위하여 구조해석을 수행하였음.
- TUNDISH에 대한 무게 중심을 계산하여 설계에 이용함.

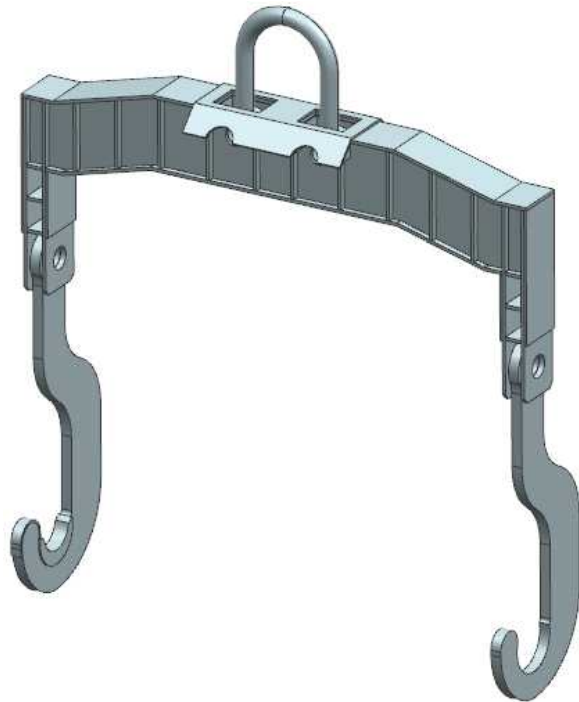


TUNDISH HANGER 구조해석

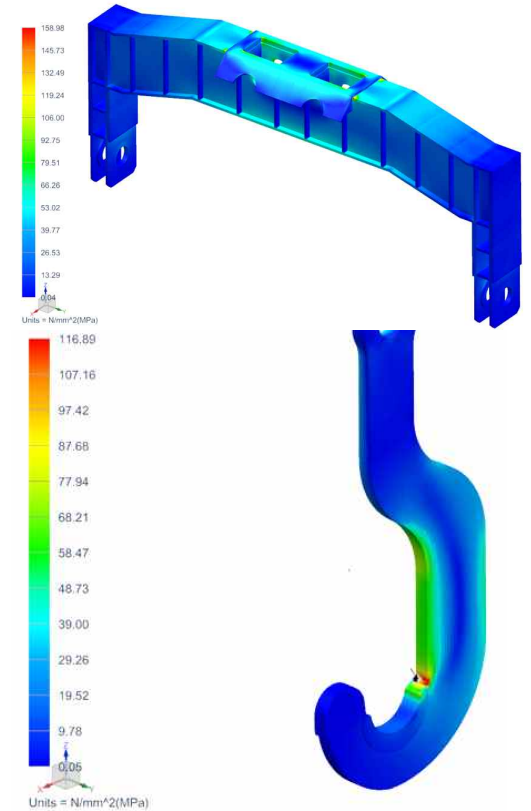
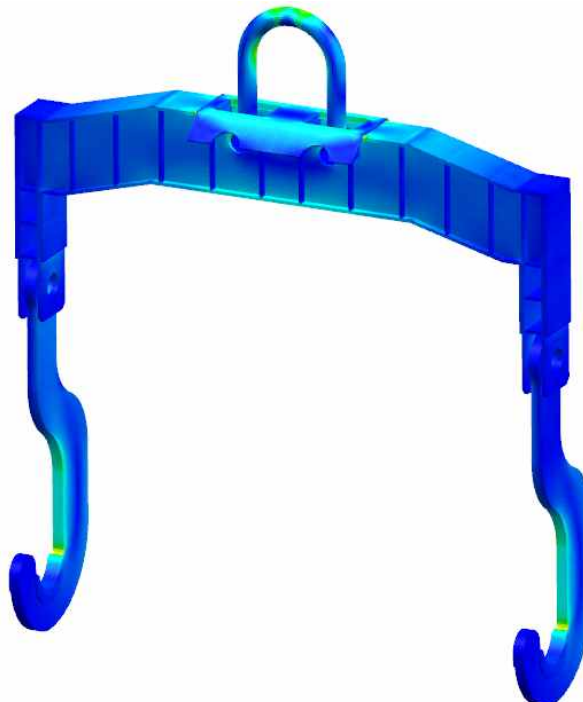
3D 모델링 및 무게 중심 계산

100ton LADLE HANGER 구조해석

- 100ton LADLE HANGER 구조적 안전성을 검토하기 위하여 구조해석을 수행하였음.



LADLE HANGER 3D 모델



LADLE HANGER 구조해석 결과

감사합니다.



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