HYLOT

HYdrogen Liquefaction & value chain Optimization Technologies (HYLOT)

KENTECH HYLOT 연구실 소개 자료

세계 최고의 수소에너지 전주기 기술 & 극저온 액화 연구실

- 소개 자료 작성 일시 : 2024년 01월 07일
- 중점 연구 분야 소개 : 2024년 기준
- 내용 : I. HYLOT
  - II. 2023년 연구실 주요 성과
  - III. 2024년 연구실 내규 및 보안
  - IV. 2024년 연구원 14인 개인별 소개
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  - VI. 2024년 논문 연구
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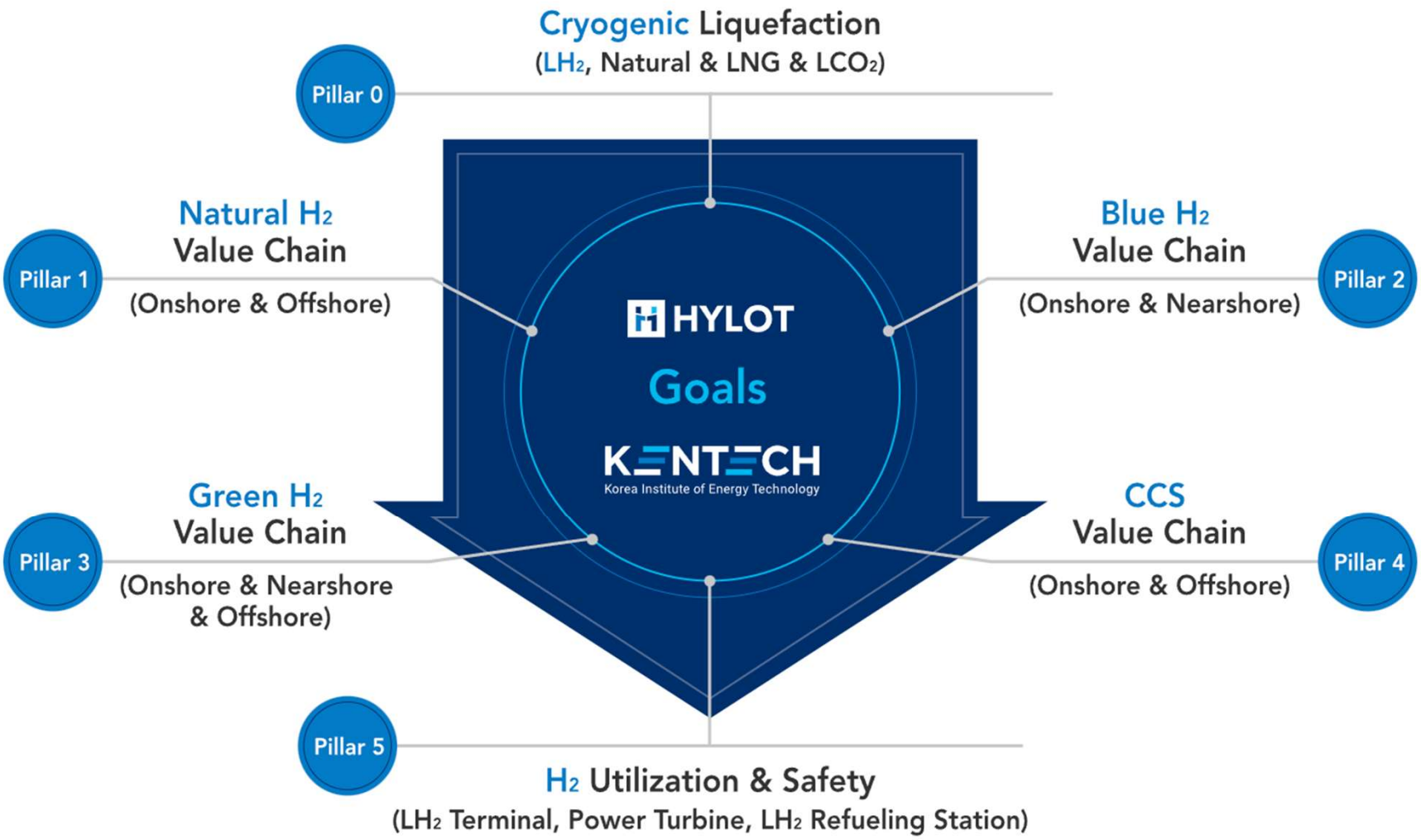
KENTECH
Korea Institute of Energy Technology

I. HYLOT

HYLOT Goals

World Leading R&D Lab for
HYdrogen Liquefaction & Value Chain Optimization Technologies(HYLOT)



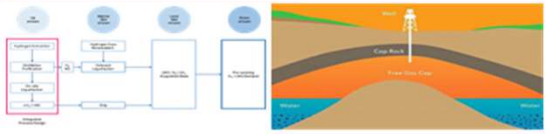
HYLOT Value Position

HYLOT

H_2 Production

Hydrogen As Primary E-Source

Natural H_2 Exploration and Production
(Onshore & Offshore)



Hydrogen As Secondary E-Source

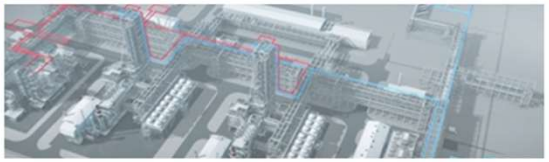
Blue H_2 Production (SMR, ATR + CCS) (Onshore & Nearshore)

Hydrogen As Secondary E-Source

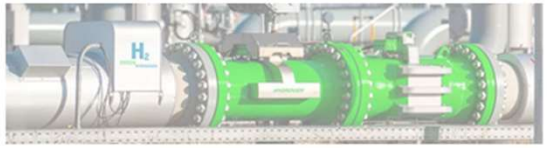
Green H_2 Production (Electrolysis)
(On-Offshore & Nearshore)

H_2 Storage / Transport

LH_2 with Cryogenic Liquefaction



Hydrogen Pipeline



Hydrogen Truck for Land

Hydrogen Ship/Vessel for Marine

H_2 Utilization

H_2 Mobility & H_2 Refueling Station

H_2 Import Terminal

H_2 Turbine

Chemicals (Steel, NH_3, etc.)

Hydrogen Value Chain Optimization (LCA & Safety)

HYLOT Researchers

HYLOT

Cryogenic Liquefaction | Natural H_2 | Blue H_2 | Green H_2 | CCS | H_2 Utilization | External Collaborator

Search.. Search

Graduate

Cryogenic Liquefaction Team / Natural Hydrogen Team

Yesom Yun

- **Email** yesomy@kentech.ac.kr
- **Contribution to the HYLOT**

1. Cryogenic Liquefaction Technology Development, Natural Hydrogen Value Chain Development

- **Life Motto**

If it seems not bad, just begin. It becomes a valuable experience regardless of success or failure.

CV

Professor

Cryogenic Liquefaction Team

Alexander Alekseev

- **Email** Alexander.Alekseev@linde.com
- **Contribution to the HYLOT**

1. Nearshore hydrogen production & liquefaction platform development
2. Cryogenic liquefaction process technology development

- **Research Interest**

Hydrogen & LNG technology development

CV

II. 2023년 연구실 주요 성과

연구과제 수주 및 수행 역량 (켄텍 내 No.1)

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➢ 2023년 15개 정부/지자체/산업체/해외 과제 수주 및 성공적 수행 완료

1. Pohang Hydrogen Complex Terminal Development, Gyeongsangbukdo Dongbu Government & Korea Gas Technology Corporation, 2023
2. Basic Engineering and Economics of the Nearshore Green Hydrogen Production and Storage Platform, KSOE(Korea Shipbuilding & Offshore Engineering), 2023
3. R&D and Demonstration Project for Onboard Carbon Capture Technology (A part of CCUS), KRISO(Korea Research Institute of Ships & Ocean Engineering), 2023~2026
4. A Study on LH2 Process System Based on Nitrogen Expansion Cycle, KRISO (Korea Research Institute of Ships & Ocean Engineering), 2023
5. Development of Safety Assessment Manual and Facility Standards for Ammonia-coal Co-firing Power Plant, KETEP(Korea Institute of Energy Technology Evaluation and Planning), 2023~2027
6. Key Hydrogen Liquefaction Technology Development for Blue Hydrogen Project, SK E&S, 2023~2024
7. Conceptual R&D for Key Liquid Hydrogen Infrastructures, Yooshin, 2023~2024
8. Key Technology R&D for Hydrogen Storage and Transportation, DAEWOO E&C, 2023
9. Offshore hydrogen process & economic analysis, HANWHA, 2023~2024
10. Hydrogen Energy Value Chain Safety Technology Development (KETEP), 2022 ~ 2023
11. Hydrogen Liquefaction Technology Development (KEPCO), 2022 ~ 2025
12. The World's Largest Liquid Hydrogen Refueling Station Demonstration Project (KETEP), 2022 ~ 2025
13. Liquid Hydrogen Technology Advices for Mobility Application (Namyang NEXMO), 2022 ~ 2023
14. Establishment of the Boryeong Hydrogen Research Center (Boryeong-si), 2022 ~ 2023
15. LH_2 Technology Consultation (P3 Group in Germany), 2023 ~ 2024

교육 (최다 수강 학부 강의 최고 평점 및 피드백)

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➢ 2023년 1학기 학부 VC 강의 최다 수강, 최고 평점 및 피드백

과목 구분	Hydrogen Energy (황지현 교수)		트랙1		트랙2		트랙3		트랙4		전체	전체	전체
문항	평균	표준편차	평균	표준편차	평균	표준편차	평균	표준편차	평균	표준편차	응답자수	평균	표준편차
교수자는 수업과 학습자에 맞는 다양한 매체들을 활용하고 있다.	9.70	1.00	8.31	2.55	9.00	1.45	9.14	0.99	9.38	1.05	85.00	9.18	1.52
나는 수업 과제(프로젝트, 퀴즈, 예습 등)를 열심히 수행하고 있다.	9.70	1.00	8.38	2.59	9.05	1.39	8.93	0.96	9.44	1.06	85.00	9.18	1.51
나는 이 수업에 대해 전반적으로 만족한다.	9.70	1.00	8.38	2.59	8.89	1.52	8.71	1.28	9.06	1.30	85.00	9.04	1.61
나는 이 수업에서 교수님과 동료의 목소리를 경청하고 있다.	9.74	0.85	8.31	2.61	9.05	1.39	9.00	0.93	9.44	1.12	85.00	9.19	1.51
나는 이 수업의 학습활동을 수행하며 어려움을 느낀다.	6.17	3.51	6.23	3.56	6.11	3.19	4.21	2.43	5.81	3.03	85.00	5.78	3.28
나는 활발하게 질문하고 토론하며 수업 활동에 적극 참여하고 있다.	9.65	1.00	8.23	2.66	9.05	1.39	8.86	1.12	9.25	1.15	85.00	9.09	1.57
이 수업에서는 내가 직접 무엇인가를 설계하고 만들어낼 수 있다.	9.74	0.74	8.46	2.56	9.21	1.28	9.14	0.91	9.25	1.09	85.00	9.24	1.43
이 수업에서는 동기부여가 잘 되어 스스로 학습에 흥미를 갖고 참여하게 한다.	9.78	0.66	8.38	2.59	8.79	1.61	9.07	0.88	8.63	2.12	85.00	9.01	1.72
이 수업에서는 동료와의 협업과 소통을 장려하고 있다.	9.83	0.64	8.46	2.56	9.05	1.28	9.21	0.77	9.38	1.11	85.00	9.26	1.42
이 수업에서는 수업의 목표, 과정, 평가 방법을 교수자와 함께 논의하여 수정할 수 있다.	9.83	0.64	8.23	2.72	8.84	1.50	9.14	0.83	8.94	1.34	85.00	9.08	1.57
이 수업에서는 학교 밖의 세상(사회/현장)과 연계된 실제 문제를 다룬다.	9.78	0.66	8.46	2.56	9.05	1.32	9.36	0.81	9.38	1.11	85.00	9.27	1.43
이 수업은 기초 지식을 학습하는데 도움이 된다.	9.78	0.83	8.46	2.56	8.21	2.21	8.29	1.71	8.63	2.29	85.00	8.76	2.04
이 수업은 비판적, 분석적, 통합적 사고를 할 수 있도록 구성되어 있다.	9.78	0.66	8.38	2.59	8.84	1.42	9.07	1.03	9.06	1.14	85.00	9.11	1.50
이 수업은 여러 분야의 내용을 함께 배울 수 있는 융합형 수업이다.	9.83	0.48	8.38	2.59	8.95	1.32	8.86	1.36	8.63	2.12	85.00	9.02	1.70
이 수업은 토론, 토의로 자유롭게 의사를 표현하도록 한다.	9.83	0.64	8.31	2.64	8.89	1.45	9.21	0.86	9.38	1.11	85.00	9.20	1.50
이 수업은 학습 내용을 바탕으로 창의성을 발현할 수 있다.	9.78	0.83	8.46	2.56	8.84	1.42	9.21	0.77	9.06	1.14	85.00	9.14	1.48
이 수업의 과제(또는 시험) 분량은 수행하기에 적절했다.	9.09	1.59	8.15	2.57	9.00	1.41	8.50	1.40	8.69	2.28	85.00	8.75	1.88
이 수업의 학습을 위해 매주 사용한 시간을 알려주세요. (수업시간 제외) 1시간 이하: 1, 10시간 이상: 10	7.70	2.73	6.31	3.49	6.95	2.74	4.50	2.06	5.50	3.30	85.00	6.38	3.09

➢ 2023년 여름계절학기 학부 극저온 액화 / 열역학 강의 만석, 최고 평점 및 피드백

2023년도 하계계절학기 기말평가 결과비교(학생,교수)

교수명 : 황지현 출력일시 : 2023년 12월 31일 18시 53분 20초

문항명	점수	그래프
강의실의 시설 및 환경 등은 수업 진행에 적합하다. (ALC 강의실, 세미나실, 온라인 강의실)	9.93	9.93
교수자는 수업과 학습자에 맞는 다양한 매체들을 활용하고 있다.	10.00	10.00
나는 이 수업에서 교수님과 동료의 목소리를 경청하고 있다.	10.00	10.00
나는 활발하게 질문하고 토론하며 수업 활동에 적극 참여하고 있다.	9.93	9.93
나는 수업 과제(프로젝트, 퀴즈, 예습 등)를 열심히 수행하고 있다.	10.00	10.00
이 수업의 교수자는 100% 영어로 수업을 진행하였다. (영어 진행수업이 아닐 경우 "1"로 응답)	9.93	9.93
수업 시간에 나는 영어를 사용하여 수업활동(토론, 질문, 팀 활동)에 참여한다. (영어 진행수업이 아닐 경우 "1"로 응답)	9.80	9.80
이 수업의 과제(또는 시험) 분량은 수행하기에 적절했다.	9.80	9.80
이 수업의 학습을 위해 매주 사용한 시간을 알려주세요. (수업시간 제외) 1시간 이하: 1, 10시간 이상: 10	6.93	6.93
나는 이 수업의 학습활동을 수행하며 어려움을 느낀다.	6.20	6.20
나는 이 수업에 대해 전반적으로 만족한다.	9.93	9.93

교육 (산업체 최고 피드백 장수 강의)

HYLOT

➢ 서울대학교 EDRC 주최 산업체 일주일 특강, EDRC 8년 연속 최고 피드백 최장수 강의

강의 수강생 평가 결과

- 평가 과목 : Practical LNG & Hydrogen
- 평가 수 : 총 31개 (대학원생 : 14, 재직자 : 17)

평균 평점 : 4.56 (5점 기준) / 95.6 (100점 기준)

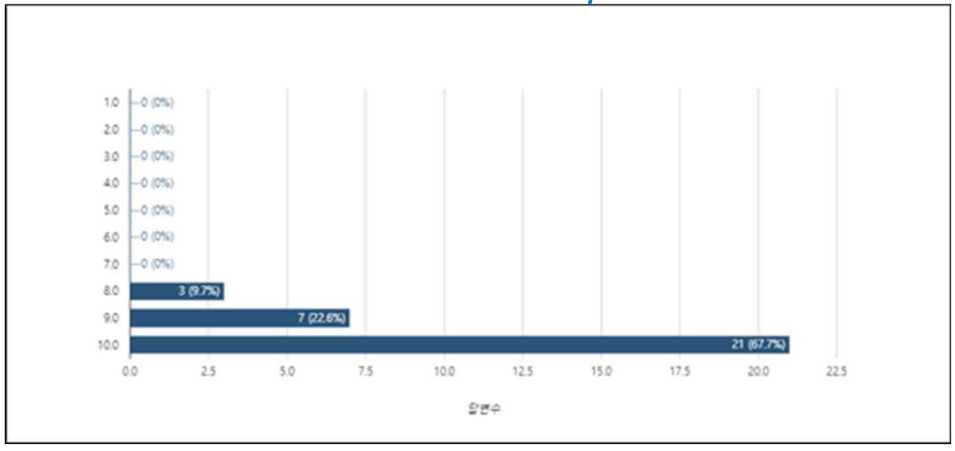
문 항		평 가(%)
강의 내용	1. Syllabus의 강의 내용 설명정도	
	2. 강의 내용 최신의 정확한 자료여부	
	3. 강의가 전문분야 이해와 지식습득에 도움	
	4. 교재의 구성과 내용에 대한 만족도	
강의 전달	5. 강사의 이론 및 실무 지식전달의 효과성	
	6. 강사의 질의응답 성실도	
실습 내용	7. 강의 이해에 대한 실습의 효과	
	8. 적당하다고 생각하는 실습비율 평균	
	9. 실습 난이도	
강의 종합	10. 강의 전체 만족도	
	11. 강의가 실무에 도움	
	12. 강의 추천여부	
	13. 적당하다고 생각하는 강의 시간 평균	

문 항	평 가(%)					
	96이상	91~95	86~90	81~85	80이하	무응답
총 합 (8,9,13번 제외)	71.9	14.7	11.6	1.6	0.0	0.0

* 14~16 주관식 문항 강의별 개별 문서 참고 바람.

EDRC 엔지니어링개발연구센터

➢ 선박해양플랜트 연구소 주최 산업체 3일 특강, 3년 연속 최고 피드백 강의



해외 논문 / 해외&국내 학회 (해외 게재 집중)

➢ 2023년 해외 저널지 2건, 해외 학회지 6건, 국내 학회지 3건

1. Integration of the Single-Effect Mixed Refrigerant Cycle with Liquified Air Storage Energy and Cold Energy of LNG Regasification : Energy Exergy, and Efficiency Prospectives (International Journal)
2. Development of Technical Specifications and Process System Requirements for the World's Largest LH2 Refueling Station (International Journal)
3. Introduction of Korea green energy island project with near shore hydrogen production platform; the most economical option for hydrogen production (International Conference, Gastech 2023 in Singapore)
4. Green Hydrogen Conversion/Transport Technology (International Conference, UN 2023 in Busan)
5. Safety evaluation / demonstration and development of safety standards for the establishment of liquid hydrogen refueling station (International Conference, JACKS 2023 in Australia)
6. Nearshore hydrogen production / liquefaction technology development (International Conference, Positioning Hydrogen in Australia)
7. New concept development on green hydrogen production & liquefaction platform (International Conference, EKC2023 in Germany)
8. Development of the Nearshore Hydrogen Production and Liquefaction Platform for Energy Island Projects in South Korea (2023 Germany-Korea Hydrogen Conference in Seoul)
9. 연안 부유식 수소생산 및 액화 기술 개발 (Domestic Conference, 수소 및 신에너지학회 춘계학술대회)
10. 한국형 액화수소 충전소 기술사양 설계 및 설계 기준 개발 (Domestic Conference, 수소 및 신에너지학회 추계학술대회)
11. 선상 탄소 포집, 액화 및 저장 기술 경제성 분석 (Domestic Conference, 한국해양환경-에너지학회 춘계학술대회)

산학협력 (켄텍 내 No.1)

HYLOT

➢ 20건 이상 국내외 연구개발 관련 업무 협약 체결

해외 청정수소 인수기지 기술협력 협약서

한국동서발전㈜, ㈜대우건설, ㈜유신, 한국에너지공과대학교, 한국해양대학교, 창원대학교 (이하 "협약 당사자")는 대규모 수소발전소의 연료 부대시설인「액화수소 인수기지」의 설계 기술 역량 확보를 위해 아래와 같이 협약을 체결하고 상호 협력하기로 한다.

제 1 조 【목적】

본 협약은 협약 당사자가 상호 간 보유한 역량을 활용하여 해외 청정(액화)수소 인수에 필요한 선박의 접안, 하역, 저장, 기화 · 송출 등 관련한 상부 시설 및 항만에 대한 개념설계와 기본설계에 협력함으로써 청정수소의 해외 도입을 위한 인수기지 설계 기술을 선도하는 한편, 탄소중립2050을 적기에 달성하는 데 그 목적이 있다.

제 2 조 【협력사항】

협약 당사자는 다음의 분야에 대해 긴밀히 협력하고, 세부 내용과 방법은 상호 간 협의로 결정한다.

1. 발전시설에 수소 혼소 · 전소, 수소발전 연구개발 및 실증 한국동서발전(주)
2. 액화수소 인수기지 기본설계 및 항만시설 검토 ㈜대우건설
3. 액화수소 인수기지 상부시설설계, 수소정책 및 기술동향 검토 ㈜유신
4. 액화수소 저장, 처리설비 개념설계 및 기술 자문 한국에너지공과대학교
5. 액화수소운송선박 기술 동향 및 시장 전망 창원대학교
6. 액화수소운송선박 접 · 이안 및 운항 안전성 검토 한국해양대학교
7. 정부 및 지자체, 관련기관 요청 시 자문 등 상호 업무 지원 협약 당사자 모두

창업 (켄텍 1호 창업)

HYLOT

➢ 켄텍 1호 창업 / SK E&S 연구 과제 수주 및 수행 중 (기술 창업 분야 KENTECH Award 수상)

액화수소 전문기업

주식회사 헵타

H+epta 대표 황지현

해외협력 (국내 최고)

➢ 세계 최초 수소에너지 FIP 연구소 국내 유치 및 켄텍 내 개소 / 독일 Linde, 프라운호퍼 연구소 등과 해외공동연구 진행

봉사 (학교 교육/행정/입시 집중)

- 수소 에너지 트랙 책임 교수 (교육 및 봉사 영역 담당)
- 학부 3기 입시 홍보 위원 및 심사 위원
- 학부 교육 혁신 위원회 위원
- 학부 겸무 교수
- 학부 교육 과정 설계
- 대학원 운영 위원
- 대학원 입시 심사 위원
- 국내외 언론 홍보

사회 영향력 (국내외 큰 사람)

- 11차 전력수급위원회 위촉 (정부, 국내 수소 전문가 2인 중 1인 선정)
- 수소발전입찰시장 실무협의회 위원 위촉 (정부, 국내 수소 전문가 유일 선정)
- 수소에너지 FIP Managing Director 위촉 (해외, 세계 최초)
- 보령시 수소정책위원 위촉 (지자체)
- 충남도 수소전문위원 위촉 (지자체)
- 광양시 수소산업 육성위원 위촉 (지자체)
- 수소경제와 미래산업포럼 회원 (산업체)
- 미래에너지정책연구원 회원 (산업체)
- 국회위원 정책 자문위원 위촉 (정부)
- 한국과학기술단체총연합회 위원 위촉 (산업체)

III. 2024년 연구실 내규 및 보안

연구실 내규 – 연구원 등급제

HYLOT

HYLOT 연구원 등급제

등급	자격조건	의무	권리
천연 (Natural)	✓ 대학원생	✓ 연구 및 논문 ✓ 주 5일 연구실 근무 (필요시 유연 근무 가능) ✓ 연구 과제 수행 (보안 유지 과제 수행)	✓ 해외 공동 연구 및 해외 중장기 파견 연구 ✓ SCI 논문 1저자 ✓ 국내외 학회 출장 ✓ 국내외 과제 출장 ✓ 국내외 교육 출장 ✓ 개인 자리 배석 ✓ 연구수당 지급 ✓ 개인별 미래 커리어 맞춤형 책임 지도 ✓ 워크숍 및 연구실 이벤트, 회식 ✓ 졸업 후 Alumni 등록 및 Life Cycle Care
그린 (Green)	✓ 학부 4학년 ✓ 학부 2 & 3 학년 HYLOT 기존 멤버들 중 매우 적극적인 희망자	✓ 연구 및 논문 ✓ 주 3일 연구실 근무 (필요시 유연 근무 가능) ✓ 연구 과제 수행 (보안 유지 과제 수행)	✓ SCI 논문 1저자 ✓ 국내외 학회 출장 ✓ 국내외 과제 출장 ✓ 국내외 교육 출장 ✓ 개인 자리 배석 ✓ 워크숍 및 연구실 이벤트, 회식
블루 (Blue)	✓ 학부 2 & 3 학년	✓ 자율 근무 (기숙사 및 희망하는 장소에서 자율 근무가능) ✓ 연구 과제 수행 (비보안 유지 과제 수행)	✓ 국내 학회 출장 ✓ 국내 과제 출장 ✓ 워크숍 및 연구실 이벤트, 회식 ✓ 자유롭게 타연구실 이동 가능
그레이 (Gray)	✓ 학부 1학년	✓ 자율 근무 (기숙사 및 희망하는 장소에서 자율 근무가능) ✓ 관심 분야 공부 및 희망 시 가볍게 연구 과제 자료 조사 수행 (비보안 유지 과제 수행)	✓ 국내 과제 출장 ✓ 워크숍 및 연구실 이벤트, 회식 ✓ 자유롭게 타연구실 이동 가능

- **상기 등급제로 인해 학부 1학년 연구생 수를 제한하지 않음 (단, 연구실 연구원 총원이 20명을 초과하지 않음)**
- **그린 등급의 경우 의무 사항 3회 위반 또는 소홀 시 블루 등급으로 강등**
- **지도 교수 및 행정 선생님이 의무 사항 점검 및 관리**

연구실 내규 – 연구실 의무 사항

- 서로 간에 항상 존중하는 마음 가질 것
- 주간 연구 관련 미팅 : 매주 수요일 (그린 등급 이상 참석)
  - 대학원생 : 오전 시간 대
  - 학부생 : 오후 시간 대
  - 지도교수 – 개인별 미팅 시간은 장하련 선생님께서 담당
- 월간 연구 관련 미팅 : 매월 마지막주 수요일 (연구원 전원 참석)
  - 한달 동안 진행했던 논문 연구 및 연구 과제 공유 시간
  - 오후 2 ~ 6 시 까지 오후 시간대 전체
  - 미팅 후 연구실 회식
- 분기별 워크숍 : 매분기 금-토요일 (연구원 전원 참석)
  - 분기별 연구 성과 공유 및 팀빌딩
  - 일정 및 장소는 다수결로 정함
  - 원구원들 중 1명과 장하련 선생님께서 담당

연구실 내규 – 연구실 권리 사항

- 논문 연구 및 연구 과제를 진행함에 있어 지도교수의 전적인 지원을 받을 수 있음
- 등급제에 따른 국내외 교육 / 학회 / 과제 출장
- 국외 출장의 경우 개인별 논문 투고 결과에 따라 신청 및 연구실 지원으로 나갈 수 있음
- SCI 급 저널 1저자 논문 성과에 대해서는 아래와 같은 추가 권리 사항
  - 대학원생 : 지도 교수 재량 내 연말 연구 수당 책정에 고려 / 연구실 지원으로 해외 학회 & 교육 출장
  - 학부생 : 방학 기간 중 연구실 지원으로 해외 교육 출장 / 대학원 진학 시 연구 실적으로 미리 인정으로 인한 학위 과정 단축
- 미래 커리어에 따른 맞춤형 지원
  - 대학원생 : 대학원 시작 또는 1학년 마치는 시점에 미래 커리어 (대학/정출연/해외취업/국내취업/창업 등) 를 결정하고 이에 맞춰 연구 및 교육 진행
  - 학부생 : 3학년 시작되는 시점에 대학원 진행 여부를 결정하고 이에 맞춰 연구 및 교육 진행 / 4학년 시점에는 HYLOT 연구실 대학원 진행 예정인 학부생들로만 연구 및 교육 진행

연구실 내규 – 학부 연구원 규정

HYLOT 학부 연구원 규정

HYLOT 학부연구생 매뉴얼

초안 제작: 학부 2기 한서진

초안 감수: 학부 2기 김여원, 유수현, 이인우, 이현화, 정민기, 최윤정, 한서진

- 기본적으로 상기 학부 연구원 규정이 Bible 임
- 연구원 등급제 내용 반영 후 개정 예정

연구실 보안 – 연구실 서버 구축 및 보안 등급

- 연구실 서버 관리자 : 김준석 대학원생
- 기본적인 논문 연구 및 과제 수행은 연구실 서버 폴더에 접속해서 진행
  - 논문 연구 폴더 : 연구원 등급제에 따른 논문 주제 배정
  - 연구 과제 폴더 : 연구원 등급에 따른 연구 과제 배정
- 서버 폴더 별 아래와 같이 보안 등급 부여
  - 무탄소 등급 : 지도교수만 접속 가능 폴더들
  - 천연 등급 : 대학원생 이상 등급 접속 가능 폴더들
  - 그린 등급 : 연구실 예비 대학원생 이상 등급 접속 가능 폴더들
  - 블루 등급 : 학부 2,3학년 이상 등급 접속 가능 폴더들
  - 그레이 등급 : HYLOT 연구실 모든 연구원들 접속 가능 폴더들
- 그린 등급 이상은 수행 논문 연구 및 연구 과제 성격에 따라 연구실 자체 보안 서약서 작성 및 서명
- 연구실 서버 사용법 : 김준석 대학원생

IV. 2024년 연구원 14인 개인별 소개

HYLOT 연구원 – 대학원생 및 인턴

Graduate

Cryogenic Liquefaction Team / Green Hydrogen Team

Yuree Byun

- **Email** Yureb2000@kentech.ac.kr
- **Contribution to the HYLOT**

1. Gastech 2023 paper preparation, Nearshore hydrogen production and liquefaction platform development
2. Liquid hydrogen refueling station technology and standard development.

- **Research Interest**

Hydrogen liquefaction optimization, Process exergy analysis, LCA

- **Life Motto**

A journey of a thousand miles begins with a single step.

CV

Green H_2 (kentech.ac.kr)

Graduate

Cryogenic Liquefaction Team / Natural Hydrogen Team

Junseok Kim

- **Email** junseokkim@kentech.ac.kr
- **Contribution to the HYLOT**

1. Development of natural hydrogen liquefaction process technology

- **Research Interest**

H_2 Value Chain Technologies (Blue H_2(SMR + CCUS)), LH_2 Liquefier Technologies

- **Life Motto**

The regret after not doing something is far bigger than that of doing something.

CV

Natural H_2 (kentech.ac.kr)

Graduate

Cryogenic Liquefaction Team / Natural Hydrogen Team

Yesom Yun

- **Email** yesomy@kentech.ac.kr
- **Contribution to the HYLOT**

1. Cryogenic Liquefaction Technology Development, Natural Hydrogen Value Chain Development

- **Life Motto**

If it seems not bad, just begin. It becomes a valuable experience regardless of success or failure.

CV

Cryogenic Liquefaction (kentech.ac.kr)

Winter-Semester Intern

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Jiwoon Song

- **Email** thdwldns@snu.ac.kr
- **Contribution to the HYLOT**

1. Intern
2. Liquid hydrogen BOG (Boil-Off Gas) process development from LH2 storage tanks

- **Research Interest**

LH2/LNG Cryogenic Liquefaction Process Optimization, LH2 Tanks Design, Wind Turbine

CV

Cryogenic Liquefaction (kentech.ac.kr)

HYLOT 연구원 – 신입 대학원생

- 2024년 하반기 입학 (9월) 1 ~ 2 명 영입 예정
- 접수 방법 : 간략한 CV 작성 후 황지현 교수 이메일로 접수 (jihyun.hwang@kentech.ac.kr)
- 합격 시 2024년 하반기 입학 하기 전 연구실 연구원 활동 시작 가능

HYLOT 연구원 – 학부 3학년 (켄텍 1기)

1st Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Gahyeon Lee

- **Email** ghyn0106@kentech.ac.kr
- **Contribution to the HYLOT**
  1. Member of the HYLOT startup (Hepta)
  2. Undergraduate research student since 2022, thermodynamics study with lab members
  3. Natural Hydrogen study team member
- **Research Interest**
  Hydrogen value chain construction, hydrogen storage & transportation process based on hydrogen liquefaction
- **Life Motto**
  Always try your best.

CV

Cryogenic Liquefaction (kentech.ac.kr)

1st Undergraduate

Cryogenic Liquefaction Team / Blue Hydrogen Team

Seoyeon Yu

- **Email** westkite62@kentech.ac.kr
- **Contribution to the HYLOT**
  1. Gastech 2023 thesis contributor
  2. white hydrogen thesis research
- **Research Interest**
  Blue H2
- **Life Motto**
  in for a penny, in for a pound.

CV

Blue H_2 (kentech.ac.kr)

1st Undergraduate

Cryogenic Liquefaction Team / Blue Hydrogen Team

Seona Lee

- **Email** seonarayo@kentech.ac.kr
- **Contribution to the HYLOT**
  1. CCUS technology paper review and thermodynamics group study
- **Research Interest**
  blue hydrogen and CCS technology
- **Life Motto**
  Don't look back.

CV

Blue H_2 (kentech.ac.kr)

1st Undergraduate

Cryogenic Liquefaction Team / Blue Hydrogen Team / H2 Utilization Team

Suhong Kim

- **Email** tnghd3207@kentech.ac.kr
- **Contribution to the HYLOT**
  1. 2022 HRS (Hydrogen Refueling Station) current installation status research, CCUS technology paper review (Thermodynamics study with lab members)
- **Research Interest**
  Hydrogen liquefaction process design from thermodynamic theories to practical applications, Liquid hydrogen application on various disciplines, Carbon capture technologies in chemical ways such as amine absorption and its process design
- **Life Motto**
  Work hard, play hard!

CV

Cryogenic Liquefaction (kentech.ac.kr)

HYLOT 연구원 – 학부 2학년 (켄텍 2기)

2nd Undergraduate

Cryogenic Liquefaction Team / CCS Team

Hyunhwa Lee

- **Email** lhhjsjs@kentech.ac.kr
- **Contribution to the HYLOT**

1. Onboard Carbon Capture Technology with KRISO

- **Research Interest**

Carbon Capture/Utilization/Storage Technology, Blue Hydrogen, Green Hydrogen, Hydrogen Liquefaction Process, Hydrogen Cycle Process

- **Life Motto**

When life gives you lemons, make the lemonade.

CV

CCS (kentech.ac.kr)

2nd Undergraduate

Cryogenic Liquefaction Team / CCS Team

Minki Jung

- **Email** jmk8643@kentech.ac.kr
- **Contribution to the HYLOT**

1. Onboard Carbon Capture Technology with KRISO

- **Research Interest**

Carbon Capture/Utilization/Storage Technology, Green Hydrogen, Fuel cell, Hydrogen Liquefaction Process

- **Life Motto**

With great power comes great responsibility.

CV

CCS (kentech.ac.kr)

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Seojin Han

- **Email** hsjskwn2@kentech.ac.kr
- **Contribution to the HYLOT**

1. LHRS Project with KOGAS-tech (NRF Natural Hydrogen Project with KNOC)
2. Hepta IR English ver. Translation
3. SK E&S Special Lecture Slides Creation
4. 5th Hydrogen Energy Get-it-right National Contest - Grand Prize (1st Place) on Hydrogen Policy
5. 2023 Fall Academic Conference in Jeju · Presentation on Korean LHRS
6. FCEE 2024 - The First Undergraduate Student in KENTECH to be the 1st Author

- **Research Interest**

Hydrogen/Cryogenic Liquefaction Process, Hydrogen Infrastructure, LHRS, Blue Hydrogen, Natural Hydrogen, Integrated Process Design, LNG, Policy, Value Chain Optimization, Industry-academia Cooperation

- **Life Motto**

If you light a lamp for somebody, it will also brighten your path.

CV

H_2 Utilization (kentech.ac.kr)

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Suhyun Ryu

- **Email** mellon777@kentech.ac.kr
- **Contribution to the HYLOT**

1. Conducted a survey on hydrogen mobility, assessed the current status of liquefied hydrogen refueling stations, researched LNG liquefaction processes, explored hydrogen liquefaction processes, studied distributed modeling for ammonia co-firing power generation, and conducted research on the development and production status of components related to liquefied hydrogen.

- **Research Interest**

Blue Hydrogen, Green Hydrogen, White Hydrogen, Hydrogen Liquefaction Processes, Carbon Capture, Utilization, and Storage (CCUS).

- **Life Motto**

Let's strive to experience a wide range of opportunities. Let's always do my best in everything I've been given.

CV

H_2 Utilization (kentech.ac.kr)

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Yeowon Kim

- **Email** ywkimb@kentech.ac.kr
- **Contribution to the HYLOT**

1. Researched the market size of materials, components, and equipment related to carbon-neutral power sources, assessed the technological prospects, economic implications, and examined the export status.
2. Presented a proposal for a carbon-neutral value chain utilizing by products from a compost plant in Naju at the 2023 1st ACCE (Association for Carbon-Neutral Circular Economy) International Conference.
3. Translated and organized the GB 50516-2010; Technical code for hydrogen fuelling station based on domestic engineering plant terminology.
4. Contributed to the Development of Technical Specifications and Process System Requirements for the World's Largest LH2 Refueling Station, submitting the respective paper to FCEE2024. Particularly, played a significant role in detailing the overall station process by unveiling the Process Flow Diagram (PFD) for the LHRS in Yeongdong and modeling the Operational Dynamics of the LHRS Process.

- **Research Interest**

Hydrogen Liquefaction, Hydrogen Utilization, Carbon Neutrality

- **Life Motto**

The path I tread is my life, and I walk upon it freely!

CV

H_2 Utilization (kentech.ac.kr)

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Yunjeong Choi

- **Email** a3368877@kentech.ac.kr
- **Contribution to the HYLOT**

1. Wrote paper \'Development of Technical Specifications and Process System Requirements for the World's Largest LH2 Refueling Station\'

- **Research Interest**

Hydrogen utilization especially in the space industry, Hydrogen safety standard

- **Life Motto**

The mind is its own place, and in itself can make a heaven of hell, a hell of heaven.

CV

H_2 Utilization (kentech.ac.kr)

HYLOT 연구원 – 학부 1학년 (켄텍 3기)

- 2024년 상반기 모집 예정 (모집 인원은 연구실 행정 여건에 따라 결정)
- 켄텍 3기 수소에너지 VC 수업 수강자들 대상 모집 예정
- 접수 방법 : 간략한 CV 작성 후 황지현 교수 이메일로 접수 (jihyun.hwang@kentech.ac.kr)

V. 2024년 연구 목표 및 연구팀

2024년 연구 목표

- 목표 1 : 해외 유수 SCI 저널지 논문 게재 (총 10편 목표)
- 목표 2 : 국제공동 연구 과제 수행 (총 1개 대형 프로젝트 목표)
- 목표 3 : 산업체 연구 과제 수행 (총 5개 이상 프로젝트 목표)
- 목표 4 : 정부 연구 과제 수행 (총 3개 대형 프로젝트 목표)
- 목표 5 : 정출연 / 지자체 연구 과제 수행 (총 2개 프로젝트 목표)
- 목표 6 : 해외 학회 연구 결과 발표 (총 5개 이상 학회 목표)
- 목표 7 : 국내 학회 연구 결과 발표 (총 3개 이상 학회 목표)

연구팀

➢ Cryogenic Liquefaction Team

Graduate

Cryogenic Liquefaction Team / Natural Hydrogen Team

Yesom Yun

- **Email** yesomy@kentech.ac.kr
- **Contribution to the HYLOT**

1. Cryogenic Liquefaction Technology Development, Natural Hydrogen Value Chain Development

- **Life Motto**

If it seems not bad, just begin. It becomes a valuable experience regardless of success or failure.

CV

Professor

Cryogenic Liquefaction Team

Alexander Alekseev

- **Email** Alexander.Alekseev@linde.com
- **Contribution to the HYLOT**

1. Nearshore hydrogen production & liquefaction platform development
2. Cryogenic liquefaction process technology development

- **Research Interest**

Hydrogen & LNG technology development

CV

Cryogenic Liquefaction Team / Green Hydrogen Team

Fatma Yehia

- **Email** fatmayehia93@outlook.com
- **Contribution to the HYLOT**

1. SCI papers
2. Cryogenic liquefaction process technology development

- **Research Interest**

Hydrogen production & Liquefaction, LNG processes and optimization, Carbon Capture & Utilization & Storage (CCUS), Biomass & Biofuels & Waste to Energy

CV

1st Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Gahyeon Lee

- **Email** ghyn0106@kentech.ac.kr
- **Contribution to the HYLOT**

1. Member of the HYLOT startup (Hepta)
2. Undergraduate research student since 2022, thermodynamics study with lab members
3. Natural Hydrogen study team member

- **Research Interest**

Hydrogen value chain construction, hydrogen storage & transportation process based on hydrogen liquefaction

- **Life Motto**

Always try your best.

CV

Winter-Semester Intern

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Jiwoon Song

- **Email** thdwldns@snu.ac.kr
- **Contribution to the HYLOT**

1. Intern
2. Liquid hydrogen BOG (Boil-Off Gas) process development from LH2 storage tanks

- **Research Interest**

LH2/LNG Cryogenic Liquefaction Process Optimization, LH2 Tanks Design, Wind Turbine

CV

1st Undergraduate

Cryogenic Liquefaction Team / Blue Hydrogen Team / H2 Utilization Team

Suhong Kim

- **Email** tnghd3207@kentech.ac.kr
- **Contribution to the HYLOT**

1. 2022 HRS (Hydrogen Refueling Station) current installation status research, CCUS technology paper review (Thermodynamics study with lab members)

- **Research Interest**

Hydrogen liquefaction process design from thermodynamic theories to practical applications, Liquid hydrogen application on various disciplines, Carbon capture technologies in chemical ways such as amine absorption and its process design

- **Life Motto**

Work hard, play hard!

CV

연구팀

HYLOT

➢ Natural Hydrogen Team

Graduate

Cryogenic Liquefaction Team / Natural Hydrogen Team

Junseok Kim

- **Email** junseokkim@kentech.ac.kr
- **Contribution to the HYLOT**

1. Development of natural hydrogen liquefaction process technology

- **Research Interest**

H_2 Value Chain Technologies (Blue H_2(SMR + CCUS)), LH_2 Liquefier Technologies

- **Life Motto**

The regret after not doing something is far bigger than that of doing something.

CV

➢ Green Hydrogen Team

Graduate

Cryogenic Liquefaction Team / Green Hydrogen Team

Yuree Byun

- **Email** Yureb2000@kentech.ac.kr
- **Contribution to the HYLOT**

1. Gastech 2023 paper preparation, Nearshore hydrogen production and liquefaction platform development
2. Liquid hydrogen refueling station technology and standard development.

- **Research Interest**

Hydrogen liquefaction optimization, Process exergy analysis, LCA

- **Life Motto**

A journey of a thousand miles begins with a single step.

CV

➢ Blue Hydrogen Team

1st Undergraduate

Cryogenic Liquefaction Team / Blue Hydrogen Team

Seona Lee

- **Email** seonarayo@kentech.ac.kr
- **Contribution to the HYLOT**

1. CCUS technology paper review and thermodynamics group study

- **Research Interest**

blue hydrogen and CCS technology

- **Life Motto**

Don't look back.

CV

1st Undergraduate

Cryogenic Liquefaction Team / Blue Hydrogen Team

Seoyeon Yu

- **Email** westkite62@kentech.ac.kr
- **Contribution to the HYLOT**

1. Gastech 2023 thesis contributor
2. white hydrogen thesis research

- **Research Interest**

Blue H2

- **Life Motto**

in for a penny, in for a pound.

CV

➢ CCS Team

2nd Undergraduate

Cryogenic Liquefaction Team / CCS Team

Hyunhwa Lee

- **Email** lhhjsjs@kentech.ac.kr
- **Contribution to the HYLOT**

1. Onboard Carbon Capture Technology with KRISO

- **Research Interest**

Carbon Capture/Utilization/Storage Technology, Blue Hydrogen, Green Hydrogen, Hydrogen Liquefaction Process, Hydrogen Cycle Process

- **Life Motto**

When life gives you lemons, make the lemonade.

CV

2nd Undergraduate

Cryogenic Liquefaction Team / CCS Team

Minki Jung

- **Email** jmk8643@kentech.ac.kr
- **Contribution to the HYLOT**

1. Onboard Carbon Capture Technology with KRISO

- **Research Interest**

Carbon Capture/Utilization/Storage Technology, Green Hydrogen, Fuel cell, Hydrogen Liquefaction Process

- **Life Motto**

With great power comes great responsibility.

CV

연구팀

➢ Hydrogen Utilization Team

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Seojin Han

- **Email** hsjskwn2@kentech.ac.kr
- **Contribution to the HYLOT**

1. LHRS Project with KOGAS-tech (NRF Natural Hydrogen Project with KNOC)
2. Hepta IR English ver. Translation
3. SK E&S Special Lecture Slides Creation
4. 5th Hydrogen Energy Get-it-right National Contest - Grand Prize (1st Place) on Hydrogen Policy
5. 2023 Fall Academic Conference in Jeju · Presentation on Korean LHRS
6. FCEE 2024 - The First Undergraduate Student in KENTECH to be the 1st Author

- **Research Interest**

Hydrogen/Cryogenic Liquefaction Process, Hydrogen Infrastructure, LHRS, Blue Hydrogen, Natural Hydrogen, Integrated Process Design, LNG, Policy, Value Chain Optimization, Industry-academia Cooperation

- **Life Motto**

If you light a lamp for somebody, it will also brighten your path.

CV

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Suhyun Ryu

- **Email** mellon777@kentech.ac.kr
- **Contribution to the HYLOT**

1. Conducted a survey on hydrogen mobility, assessed the current status of liquefied hydrogen refueling stations, researched LNG liquefaction processes, explored hydrogen liquefaction processes, studied distributed modeling for ammonia co-firing power generation, and conducted research on the development and production status of components related to liquefied hydrogen.

- **Research Interest**

Blue Hydrogen, Green Hydrogen, White Hydrogen, Hydrogen Liquefaction Processes, Carbon Capture, Utilization, and Storage (CCUS).

- **Life Motto**

Let's strive to experience a wide range of opportunities. Let's always do my best in everything I've been given.

CV

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Yeowon Kim

- **Email** ywkimb@kentech.ac.kr
- **Contribution to the HYLOT**

1. Researched the market size of materials, components, and equipment related to carbon-neutral power sources, assessed the technological prospects, economic implications, and examined the export status.
2. Presented a proposal for a carbon-neutral value chain utilizing by products from a compost plant in Naju at the 2023 1st ACCE (Association for Carbon-Neutral Circular Economy) International Conference.
3. Translated and organized the GB 50516-2010; Technical code for hydrogen fuelling station based on domestic engineering plant terminology.
4. Contributed to the Development of Technical Specifications and Process System Requirements for the World's Largest LH2 Refueling Station, submitting the respective paper to FCEE2024. Particularly, played a significant role in detailing the overall station process by unveiling the Process Flow Diagram (PFD) for the LHRS in Yeongdong and modeling the Operational Dynamics of the LHRS Process.

- **Research Interest**

Hydrogen Liquefaction, Hydrogen Utilization, Carbon Neutrality

- **Life Motto**

The path I tread is my life, and I walk upon it freely!

CV

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Yunjeong Choi

- **Email** a3368877@kentech.ac.kr
- **Contribution to the HYLOT**

1. Wrote paper \'Development of Technical Specifications and Process System Requirements for the World's Largest LH2 Refueling Station\'

- **Research Interest**

Hydrogen utilization especially in the space industry, Hydrogen safety standard

- **Life Motto**

The mind is its own place, and in itself can make a heaven of hell, a hell of heaven.

CV

VI. 2024년 논문 연구

그린 수소 연구팀

HYLOT

- SCI Subject 1 : Nearshore Green Hydrogen Production & Liquefaction Platform – Exergy and Economic Analysis


Graduate

Cryogenic Liquefaction Team / Green Hydrogen Team

Yuree Byun

- **Email** Yureb2000@kentech.ac.kr
- **Contribution to the HYLOT**

1. Gastech 2023 paper preparation, Nearshore hydrogen production and liquefaction platform development
2. Liquid hydrogen refueling station technology and standard development.

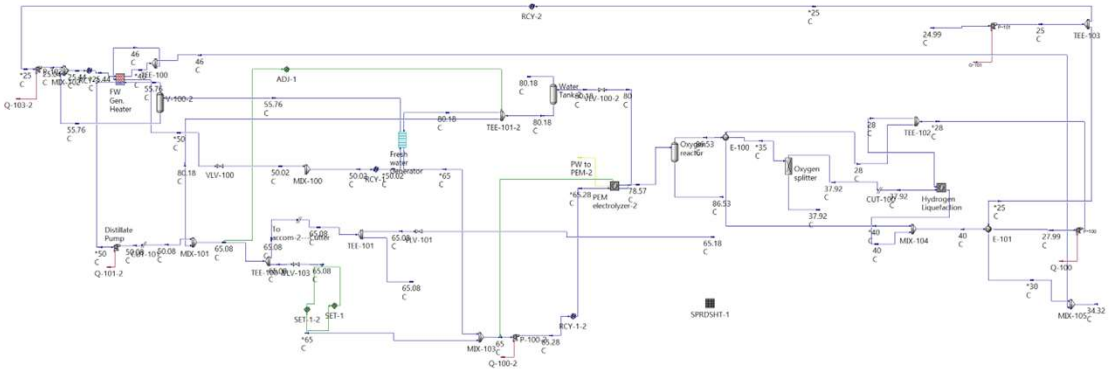
- **Research Interest**

Hydrogen liquefaction optimization, Process exergy analysis, LCA

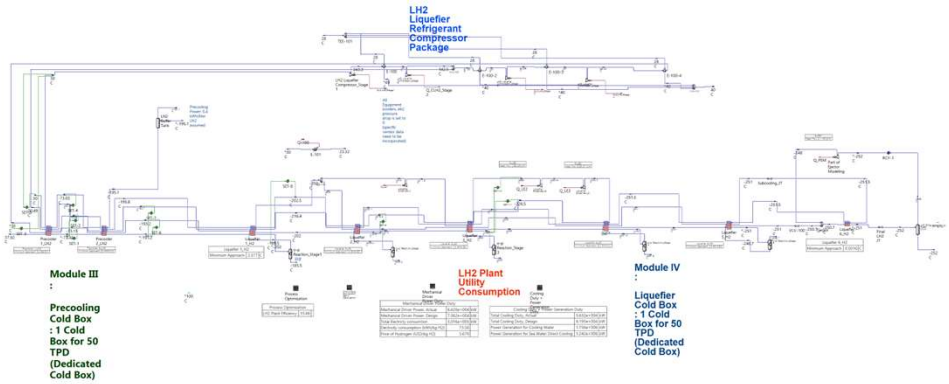
- **Life Motto**

A journey of a thousand miles begins with a single step.

CV



수전해 시스템



수소액화 시스템

그린 수소 연구팀

HYLOT

- SCI Subject 2 : Value Chain Analysis on Nearshore Green Hydrogen Production & Liquefaction Platform - 4 E Perspectives (Energy, Exergy, Economic, Efficiency) and LCA Analysis


Graduate

Cryogenic Liquefaction Team / Green Hydrogen Team

Yuree Byun

- **Email** Yureb2000@kentech.ac.kr
- **Contribution to the HYLOT**

1. Gastech 2023 paper preparation, Nearshore hydrogen production and liquefaction platform development
2. Liquid hydrogen refueling station technology and standard development.

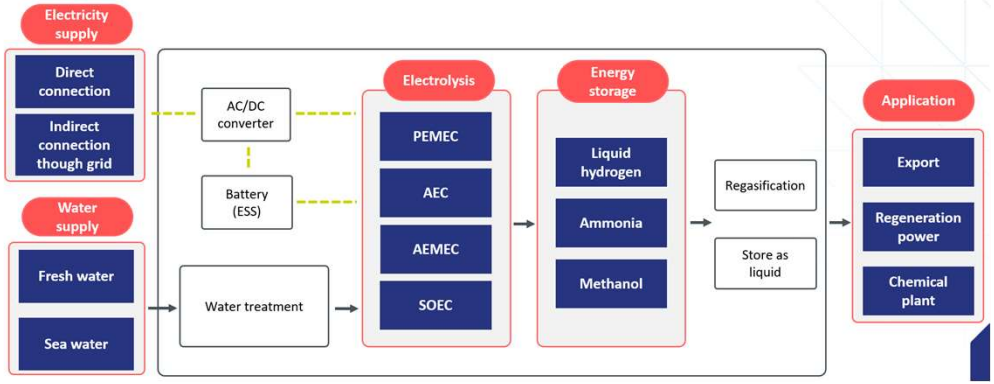
- **Research Interest**

Hydrogen liquefaction optimization, Process exergy analysis, LCA

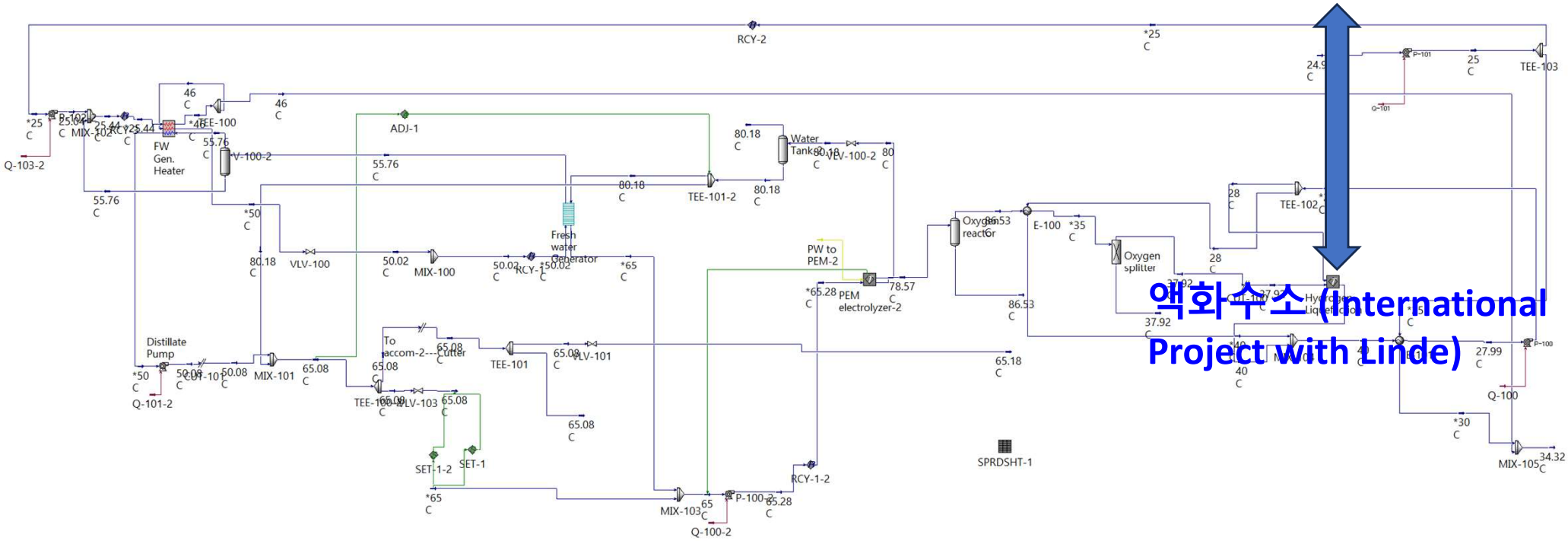
- **Life Motto**

A journey of a thousand miles begins with a single step.

CV



암모니아 (BISTEP Project)



액화수소 (International Project with Linde)

천연 수소 연구팀

HYLOT

- SCI Subject 3 : Development of Field Specific / General Natural Hydrogen Processes through analysis of global gas reservoirs

Graduate

Cryogenic Liquefaction Team / Natural Hydrogen Team

Junseok Kim

- **Email** junseokkim@kentech.ac.kr

- **Contribution to the HYLOT**

1. Development of natural hydrogen liquefaction process technology

- **Research Interest**

H_2 Value Chain Technologies (Blue H_2(SMR + CCUS)), LH_2 Liquefier Technologies

- **Life Motto**

The regret after not doing something is far bigger than that of doing something.

CV

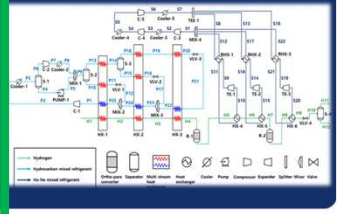
1단계
: 전세계 지역별 최적화된 천연수소 공정 제안 (천연수소, LNG, Carbon Capture 공정 위주 제안)

Before proceeding with process design, the process of investigating, reviewing, and analyzing natural hydrogen wells reported around the world must be conducted first. In addition, by studying the characteristics of the region, it is expected that it will be possible to identify promising structures and regional characteristics of natural hydrogen and help discover unknown natural hydrogen wells. First, according to previous research papers, natural hydrogen oil wells have the following characteristics.

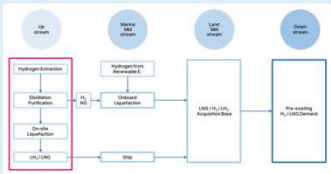
1. It has the characteristic of large changes in the behavior of natural hydrogen depending on the amount of sunlight.
2. 2. The research itself is in its early stages, and research is being conducted primarily on developing a natural hydrogen measurement device.

The main purpose of this research is to develop process simulations for each type based on data obtained through data analysis. Based on the data surveyed to date, it is expected that differences in process design will occur in the natural hydrogen process depending on the natural gas and natural hydrogen content.

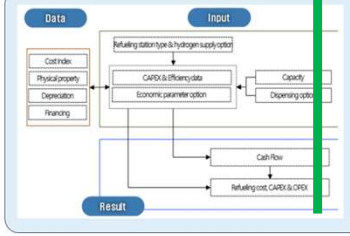
1. Separate into natural hydrogen and natural gas produced from oil wells.
2. The purity of the separated natural gas is increased through a separator.
3. Natural gas with increased purity is liquefied through a liquefaction process.
4. Transport the liquefied natural hydrogen to the consumption area.



Data Collection / Analysis → **Block Flow Diagram** → **Process Modeling** → **Economic Analysis**



The aim of our research is dealing with on-site natural hydrogen shown in the left block flow diagram, not only including hydrogen but also concerning with economically valuable gases, especially natural gas (C1).
First, natural hydrogen can be produced through commercialized extraction technologies developed for oil and gas industries. As hydrogen, natural gas, and other gases are simultaneously extracted, distillation and purification process are required to improve the purity of hydrogen.
After distillation and purification process, hydrogen and natural with five-nine purity (>99.999%) are respectively sent to liquefaction plants near the production infrastructures.
Finally, liquid hydrogen and LNG are shipped through vessels to gas acquisition bases, and supplied to various industries with high-demand.



In this study, we conduct a cost analysis of each unit technology for hydrogen production, storage/transportation, and full-cycle technology for utilization, as well as a cost analysis when applying the full-cycle technology from production to utilization.
The purpose is to obtain data on the price per unit amount of hydrogen obtained through input variables related to this such as design capacity, operating load rate, and average annual facility operation rate.
We hope that the information derived from this data can be used to build better process facilities by comparing and analyzing current hydrogen production technology.

천연 수소 연구팀

HYLOT

➢ SCI Subject 4 : Optimal Natural Hydrogen Process – Exergy and Economic Analysis

Graduate

Cryogenic Liquefaction Team / Natural Hydrogen Team

Junseok Kim

- **Email** junseokkim@kentech.ac.kr
- **Contribution to the HYLOT**

1. Development of natural hydrogen liquefaction process technology

- **Research Interest**

H_2 Value Chain Technologies (Blue H_2(SMR + CCUS)), LH_2 Liquefier Technologies

- **Life Motto**

The regret after not doing something is far bigger than that of doing something.

CV

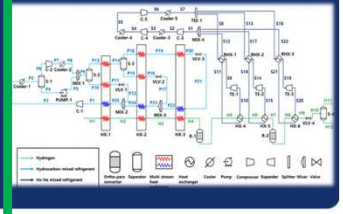
2단계
: 1단계에서 개발된 전세계 지역별 제안된 공정들에 대하여 경제성 평가를 통한 가장 경제성 있는 지역에 최적화된 공정 제안

Before proceeding with process design, the process of investigating, reviewing, and analyzing natural hydrogen wells reported around the world must be conducted first. In addition, by studying the characteristics of the region, it is expected that it will be possible to identify promising structures and regional characteristics of natural hydrogen and help discover unknown natural hydrogen wells. First, according to previous research papers, natural hydrogen oil wells have the following characteristics.

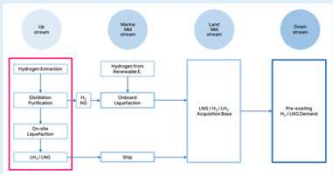
1. It has the characteristic of large changes in the behavior of natural hydrogen depending on the amount of sunlight.
2. 2. The research itself is in its early stages, and research is being conducted primarily on developing a natural hydrogen measurement device.

The main purpose of this research is to develop process simulations for each type based on data obtained through data analysis. Based on the data surveyed to date, it is expected that differences in process design will occur in the natural hydrogen process depending on the natural gas and natural hydrogen content.

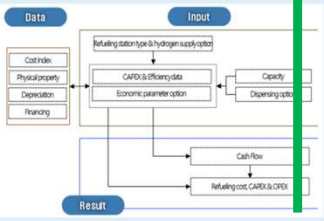
1. Separate into natural hydrogen and natural gas produced from oil wells.
2. The purity of the separated natural gas is increased through a separator.
3. Natural gas with increased purity is liquefied through a liquefaction process.
4. Transport the liquefied natural hydrogen to the consumption area.



Data Collection / Analysis → **Block Flow Diagram** → **Process Modeling** → **Economic Analysis**



The aim of our research is dealing with on-site natural hydrogen shown in the left block flow diagram, not only including hydrogen but also concerning with economically valuable gases, especially natural gas (C1).
First, natural hydrogen can be produced through commercialized extraction technologies developed for oil and gas industries. As hydrogen, natural gas, and other gases are simultaneously extracted, distillation and purification process are required to improve the purity of hydrogen.
After distillation and purification process, hydrogen and natural with five-nine purity (>99.999%) are respectively sent to liquefaction plants near the production infrastructures.
Finally, liquid hydrogen and LNG are shipped through vessels to gas acquisition bases, and supplied to various industries with high-demand.



In this study, we conduct a cost analysis of each unit technology for hydrogen production, storage/transportation, and full-cycle technology for utilization, as well as a cost analysis when applying the full-cycle technology from production to utilization.
The purpose is to obtain data on the price per unit amount of hydrogen obtained through input variables related to this such as design capacity, operating load rate, and average annual facility operation rate.
We hope that the information derived from this data can be used to build better process facilities by comparing and analyzing current hydrogen production technology.

극저온 액화 연구팀

HYLOT

- SCI Subject 5 : BOG liquefaction process development for LH2 import terminal infrastructure

Cryogenic Liquefaction Team / Natural Hydrogen Team

Yesom Yun

- **Email** yesomy@kentech.ac.kr
- **Contribution to the HYLOT**
  1. Cryogenic Liquefaction Technology Development, Natural Hydrogen Value Chain Development
- **Life Motto**
  If it seems not bad, just begin. It becomes a valuable experience regardless of success or failure.

CV

Graduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Gahyeon Lee

- **Email** ghyn0106@kentech.ac.kr
- **Contribution to the HYLOT**
  1. Member of the HYLOT startup (Hepta)
  2. Undergraduate research student since 2022, thermodynamics study with lab members
  3. Natural Hydrogen study team member
- **Research Interest**
  Hydrogen value chain construction, hydrogen storage & transportation process based on hydrogen liquefaction
- **Life Motto**
  Always try your best.

CV

1st Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Jiwoon Song

- **Email** thdwldns@snu.ac.kr
- **Contribution to the HYLOT**
  1. Intern
  2. Liquid hydrogen BOG (Boil-Off Gas) process development from LH2 storage tanks
- **Research Interest**
  LH2/LNG Cryogenic Liquefaction Process Optimization, LH2 Tanks Design, Wind Turbine

CV

Winter-Semester Intern

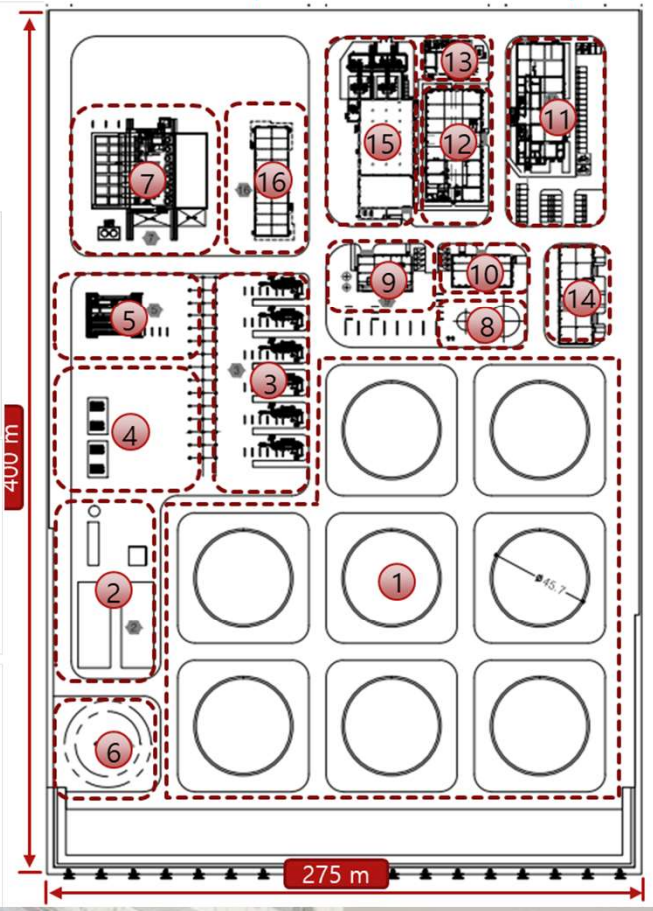
Cryogenic Liquefaction Team / Blue Hydrogen Team / H2 Utilization Team

Suhong Kim

- **Email** tnghd3207@kentech.ac.kr
- **Contribution to the HYLOT**
  1. 2022 HRS (Hydrogen Refueling Station) current installation status research, CCUS technology paper review (Thermodynamics study with lab members)
- **Research Interest**
  Hydrogen liquefaction process design from thermodynamic theories to practical applications, Liquid hydrogen application on various disciplines, Carbon capture technologies in chemical ways such as amine absorption and its process design
- **Life Motto**
  Work hard, play hard!

CV

1st Undergraduate



NO.	Description
1	LH2 Storage Tank Area
2	BOG liquefaction system
3	Vaporizer System
4	Refrigeration System
5	Send-out System
6	Flare system
7	Sea Water Intake System
8	Industrial & Potable Water System
9	Air Compressor Room
10	Fire Fighting System
11	Admin. BLDG
12	Maintenance House
13	Laboratory Building
14	Warehouse
15	Main Station
16	Sub Station

극저온 액화 연구팀

HYLOT

- SCI Subject 6 : Value Chain Analysis on LH2 import terminal infrastructure - 4 E Perspectives (Energy, Exergy, Economic, Efficiency) and LCA Analysis

Cryogenic Liquefaction Team / Natural Hydrogen Team

Yesom Yun

- **Email** yesomy@kentech.ac.kr
- **Contribution to the HYLOT**

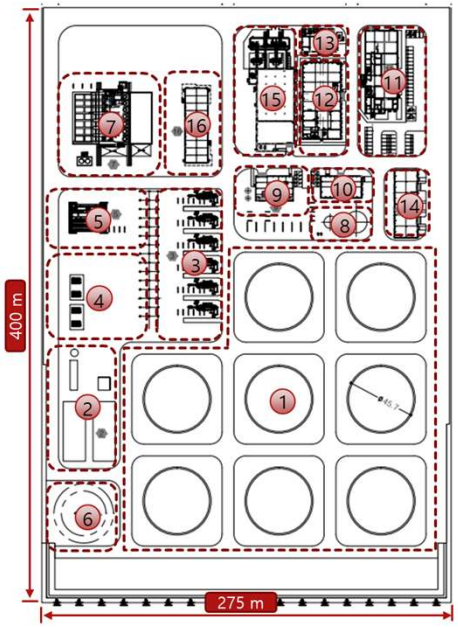
1. Cryogenic Liquefaction Technology Development, Natural Hydrogen Value Chain Development

- **Life Motto**

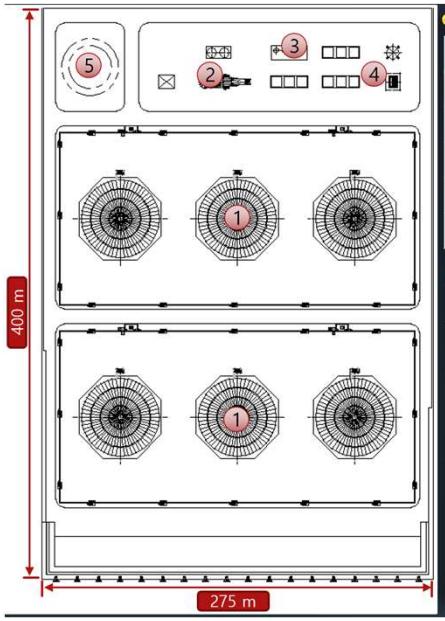
If it seems not bad, just begin. It becomes a valuable experience regardless of success or failure.

CV

Graduate



NO.	Description
1	LH2 Storage Tank Area
2	BOG liquefaction system
3	Vaporizer System
4	Refrigeration System
5	Send-out System
6	Flare system
7	Sea Water Intake System
8	Industrial & Potable Water System
9	Air Compressor Room
10	Fire Fighting System
11	Admin. BLDG
12	Maintenance House
13	Laboratory Building
14	Warehouse
15	Main Station
16	Sub Station



● 매립부지 내 설치

NO.	Description
1	Ammonia Storage Tank Area
2	Ammonia Cracking System
3	Ammonia Purification System
4	Hydrogen Compressor & Storage Tank
5	Flare system

● 매립부지 외 설치
(유틸리티 설비, 관리동 등, 약 30,000m² 면적 필요)

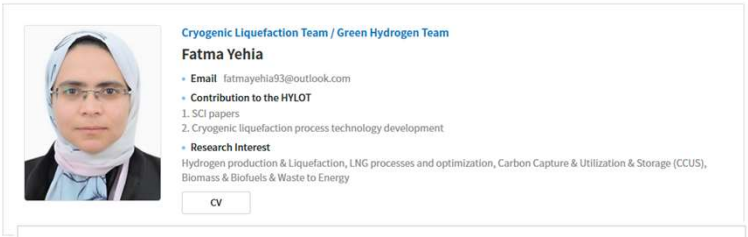
Description
Industrial & Potable Water System
Air Compressor Room
Fire Fighting System
Admin. BLDG
Maintenance House
Laboratory Building
Warehouse
Main Station
Sub Station

액화수소 도입 터미널 **VS** **암모니아 도입 터미널**

극저온 액화 연구팀

HYLOT

- SCI Subject 7 : Integration of the Single-Effect Mixed Refrigerant Cycle with Liquified Air Storage Energy and Cold Energy of LNG Regasification : Energy, Exergy, and Efficiency Prospectives



Cryogenic Liquefaction Team / Green Hydrogen Team

Fatma Yehia

- **Email** fatmayehia93@outlook.com
- **Contribution to the HYLOT**
  1. SCI papers
  2. Cryogenic liquefaction process technology development
- **Research Interest**

Hydrogen production & Liquefaction, LNG processes and optimization, Carbon Capture & Utilization & Storage (CCUS), Biomass & Biofuels & Waste to Energy

CV

Graduate

Cryogenic Liquefaction Team / Natural Hydrogen Team

Yesom Yun

- **Email** yesomy@kentech.ac.kr
- **Contribution to the HYLOT**

1. Cryogenic Liquefaction Technology Development, Natural Hydrogen Value Chain Development

- **Life Motto**

If it seems not bad, just begin. It becomes a valuable experience regardless of success or failure.

CV

1st Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Gahyeon Lee

- **Email** ghyn0106@kentech.ac.kr
- **Contribution to the HYLOT**

1. Member of the HYLOT startup (Hepta)
2. Undergraduate research student since 2022, thermodynamics study with lab members
3. Natural Hydrogen study team member

- **Research Interest**

Hydrogen value chain construction, hydrogen storage & transportation process based on hydrogen liquefaction

- **Life Motto**

Always try your best.

CV

1st Undergraduate

Cryogenic Liquefaction Team / Blue Hydrogen Team

Seoyeon Yu

- **Email** westkite62@kentech.ac.kr
- **Contribution to the HYLOT**

1. Gastech 2023 thesis contributor
2. white hydrogen thesis research

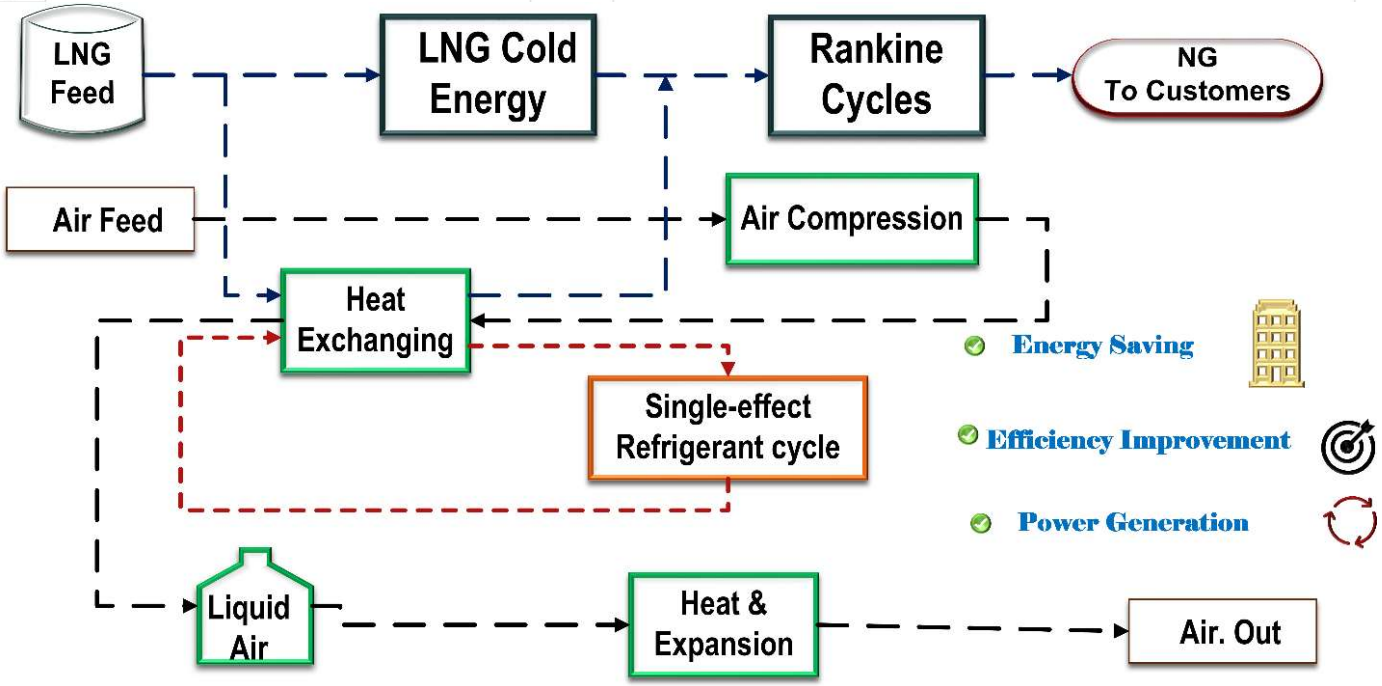
- **Research Interest**

Blue H2

- **Life Motto**

In for a penny, In for a pound.

CV



극저온 액화 연구팀

HYLOT

- SCI Subject 8 : Comprehensive State of the Art on Hydrogen Liquefaction Processes: 4E Perspectives and Analysis – Energy, Exergy, Economic, and Efficiency

Cryogenic Liquefaction Team / Green Hydrogen Team

Fatma Yehia

- **Email** fatmayehia93@outlook.com
- **Contribution to the HYLOT**
  1. SCI papers
  2. Cryogenic liquefaction process technology development
- **Research Interest**
  Hydrogen production & Liquefaction, LNG processes and optimization, Carbon Capture & Utilization & Storage (CCUS), Biomass & Biofuels & Waste to Energy

CV

Graduate

Cryogenic Liquefaction Team / Green Hydrogen Team

Yuree Byun

- **Email** Yureb2000@kentech.ac.kr
- **Contribution to the HYLOT**
  1. Gastech 2023 paper preparation, Nearshore hydrogen production and liquefaction platform development
  2. Liquid hydrogen refueling station technology and standard development.
- **Research Interest**
  Hydrogen liquefaction optimization, Process exergy analysis, LCA
- **Life Motto**
  A journey of a thousand miles begins with a single step.

CV

Graduate

Cryogenic Liquefaction Team / Natural Hydrogen Team

Junseok Kim

- **Email** junseokkim@kentech.ac.kr
- **Contribution to the HYLOT**
  1. Development of natural hydrogen liquefaction process technology
- **Research Interest**
  H_2 Value Chain Technologies (Blue H_2(SMR + CCUS)), LH_2 Liquefier Technologies
- **Life Motto**
  The regret after not doing something is far bigger than that of doing something.

CV

1st Undergraduate

Cryogenic Liquefaction Team / Blue Hydrogen Team / H2 Utilization Team

Suhong Kim

- **Email** tnghd3207@kentech.ac.kr
- **Contribution to the HYLOT**
  1. 2022 HRS (Hydrogen Refueling Station) current installation status research, CCUS technology paper review (Thermodynamics study with lab members)
- **Research Interest**
  Hydrogen liquefaction process design from thermodynamic theories to practical applications, Liquid hydrogen application on various disciplines, Carbon capture technologies in chemical ways such as amine absorption and its process design
- **Life Motto**
  Work hard, play hard!

CV

1st Undergraduate

Cryogenic Liquefaction Team / Blue Hydrogen Team

Seona Lee

- **Email** seonarayo@kentech.ac.kr
- **Contribution to the HYLOT**
  1. CCUS technology paper review and thermodynamics group study
- **Research Interest**
  blue hydrogen and CCS technology
- **Life Motto**
  Don't look back.

CV

LH2 Simulation		
Unit operations	Net Exergy	Percent %
Compressors	1133.67	12.78%
Expanders	276.85	3.12%
Reactors	451.37	5.09%
LNG Heat Exchangers	5960.08	67.19%
Coolers	1048.3	11.82%
Total	8870.312869	100.00%

Net Exergy Inlet	
Total Power of Compressors	9838.36
Hydrogen Feed Exergy	3960.55
N2 Feed Exergy	749.52
Net Exergy Outlet	
Total Power of Turbines	227.69
Hydrogen Exergy	12133.64
N2 Out Exergy	982.50
Exergy Net Destruction	21986.4529
Total Exergy Inlet	14548.43
Total Exergy Outlet	13343.8330
η	55.7%
ΣI	1204.60

Unit Operation	Exergy Loss	Percent%
LH2 Liquefier Compressor_Stage 1	286.78	3.2%
LH2 Liquefier Compressor_Stage 2	234.10	2.6%
LH2 Liquefier Compressor_Stage 3	304.42	3.4%
LH2 Liquefier Compressor_Stage 4	308.37	3.5%
Liquefier Expander_1	95.52	1.1%
Liquefier Expander_2	109.23	1.2%
Liquefier Expander_3	72.10	0.8%
o-p Reaction_Stage1	186.57	2.1%
o-p Reaction_Stage 2	63.94	0.7%
o-p Reaction_Stage 3	83.57	0.9%
o-p Reaction_Stage 4	91.44	1.0%
o-p Reaction_Stage 5	25.86	0.3%
Precooler 1_LN2	1035.27	11.7%
Precooler 2_LN2	1769.82	20.0%
Liquefier 1_H2	178.14	2.0%
Liquefier 2_H2	185.69	2.1%
Liquefier 3_H2	1197.85	13.5%
Liquefier 4_H2	1279.74	14.4%
Liquefier 5_H2	313.57	3.5%
LH2 Cooler_1	540.29	6.1%
LH2 Cooler_2	23.16	0.3%
LH2 Cooler_3	241.49	2.7%
LH2 Cooler_4	243.39	2.7%
TOTAL	8870.312869	100.000%

Summary of overall cost

Overall Cost Estimation		
Total Captial Cost	$	38,232,786.66
Compressors	$	13,977.21
Turbines	$	1,146.45
LNG Heat Exchangers	$	38,216,525.67
Reactors	$	1,032.25
Water Coolers	$	105.07
Annual operating Cost	$	8,747.10
Electricity Comsumption cost	$	6,934.10
Cooling Cost	$	124.53
Maintance cost	$	1,023.32
Labor cost	$	153.50
other costs	$	511.66
Annual sales	$	51,503.43
Ectricity sales	$	438.81
Liquid Hydrogen Sales	$	51,064.62
Annualized Value	$	(1,525,799.89)
IRR (%)	$	(0.07)
PBP (yr)	$	-
Net Present Value		
Daily average	$	(12,989,994.61)
Cost Recovery Factor		0.117459625
Annualized cost (K$)	$	325,506,012.51
Unit production cost per year(k$)	$	6,374.39

Total Captial Cost	$	38,232,786.66
Annual operating Cost	$	8,747.10
Maintance cost	$	1,023.32
Labor cost	$	153.50
Annual sales	$	51,503.43
Net Present Value	$	(12,989,994.61)
Annualized cost (K$)	$	325,506,012.51
Unit production cost per year(k$)	$	6,374.39

Exergy Analysis

Economic Analysis

블루 수소 연구팀

HYLOT

- SCI Subject 9 : Blue Hydrogen Production Value Chain Analysis – 4 E Perspectives (Energy, Exergy, Economic, Efficiency) and LCA Analysis

Cryogenic Liquefaction Team / Blue Hydrogen Team

Seona Lee

- **Email** seonarayo@kentech.ac.kr
- **Contribution to the HYLOT**
  1. CCUS technology paper review and thermodynamics group study
- **Research Interest**
  blue hydrogen and CCS technology
- **Life Motto**
  Don't look back.

CV

1st Undergraduate

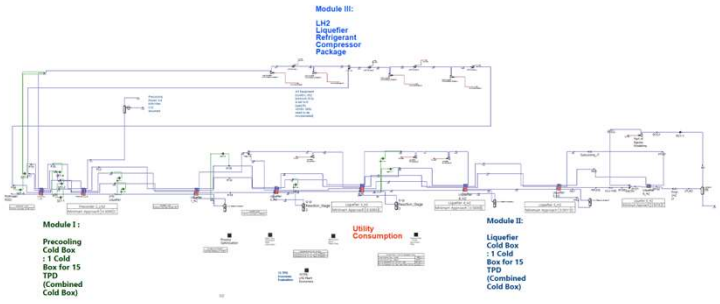
Cryogenic Liquefaction Team / Blue Hydrogen Team

Seoyeon Yu

- **Email** westkite62@kentech.ac.kr
- **Contribution to the HYLOT**
  1. Gastech 2023 thesis contributor
  2. white hydrogen thesis research
- **Research Interest**
  Blue H2
- **Life Motto**
  in for a penny, in for a pound.

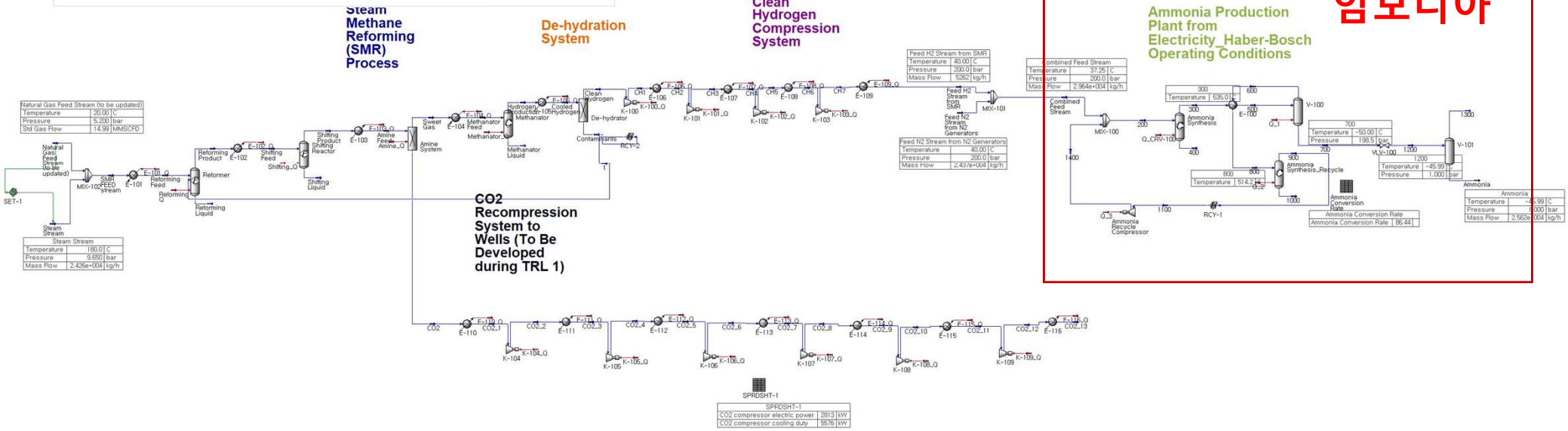
CV

1st Undergraduate



액화수소

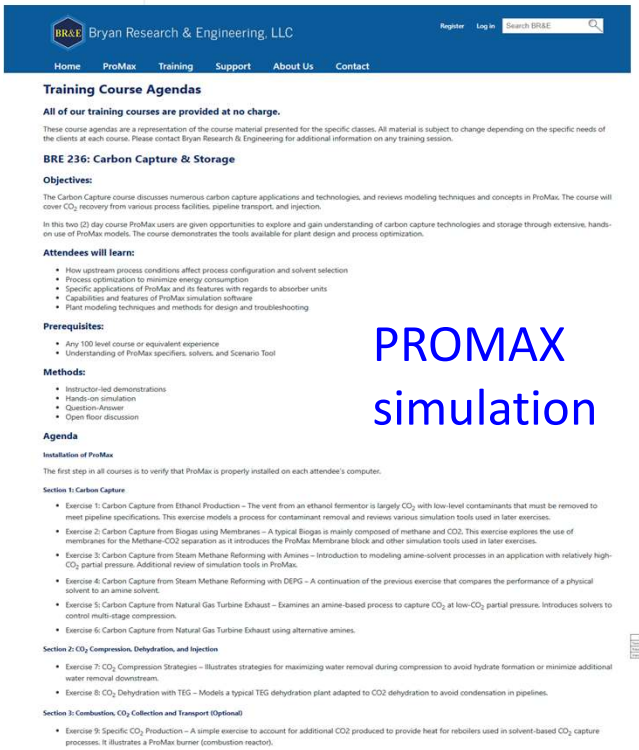
암모니아



CCS 연구팀

HYLOT

- SCI Subject 10 : Integrated process development for Onboard CCS – 4 E Perspectives (Energy, Exergy, Economic, Efficiency)



PROMAX simulation

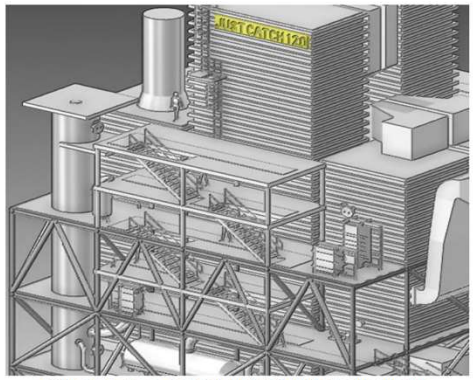
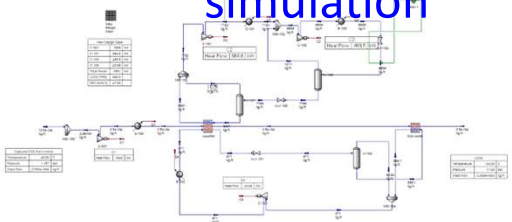
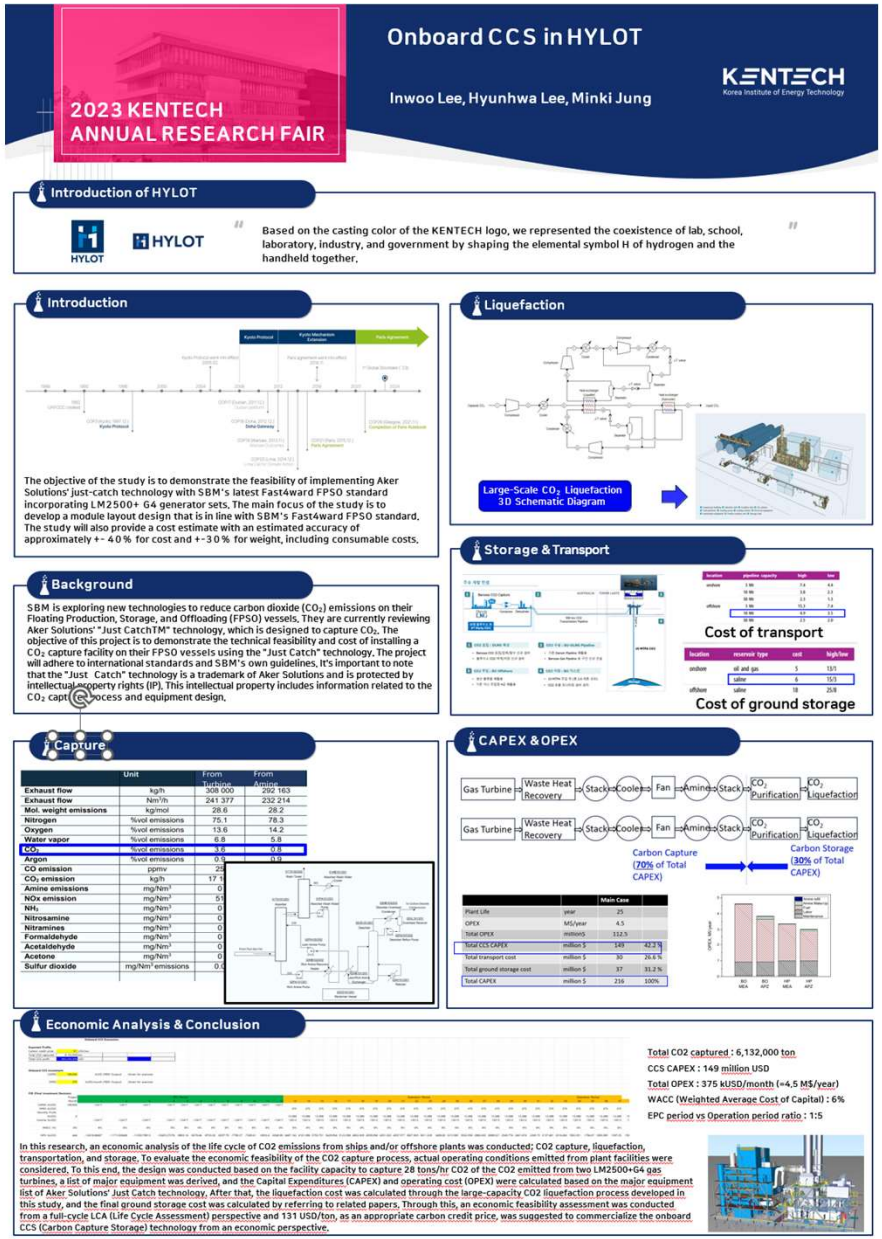


Figure 1-1. Two Just Catch™ 120 Units in one module

HYSYS simulation

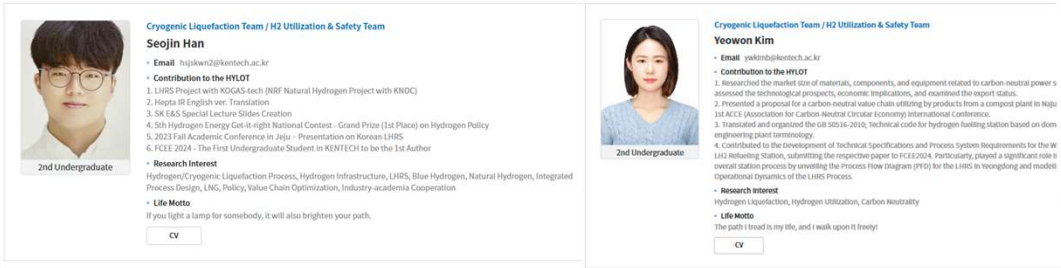


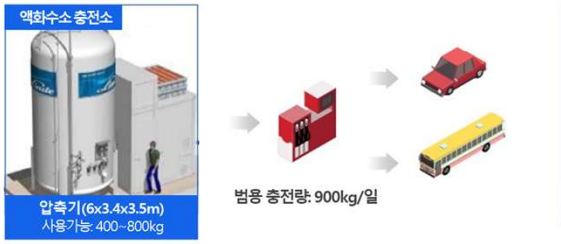


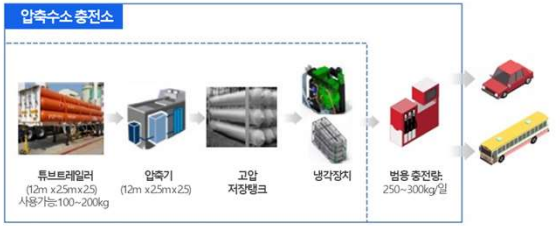
Hydrogen Utilization 연구팀

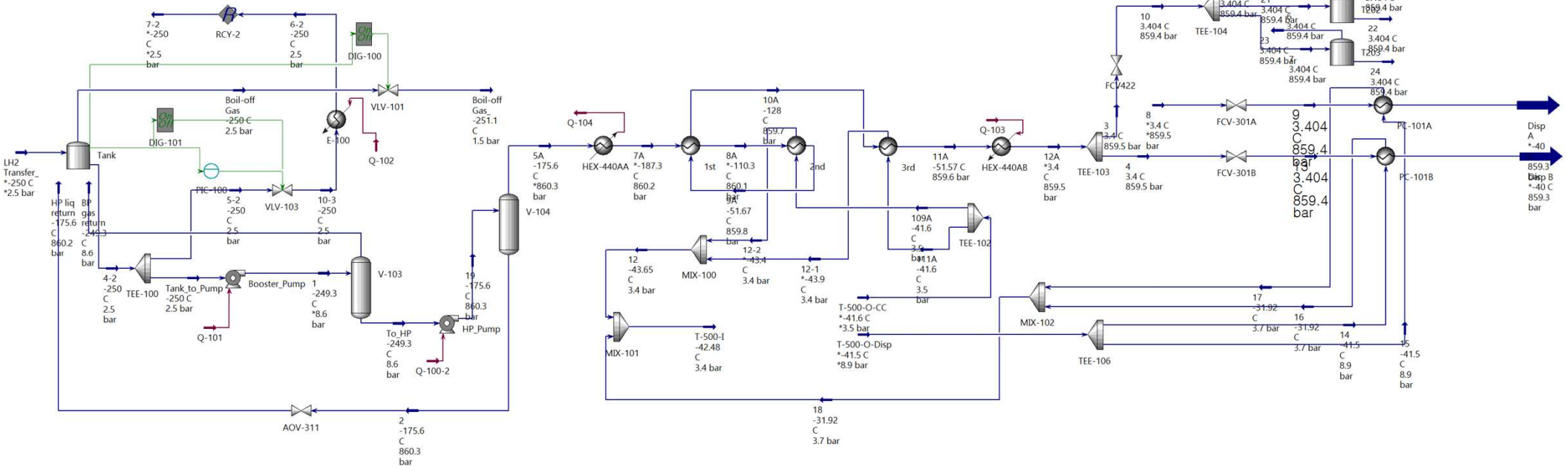
HYLOT

- SCI Subject 11 : LH2 refueling station process development – 4 E Perspectives (Energy, Exergy, Economic, Efficiency)





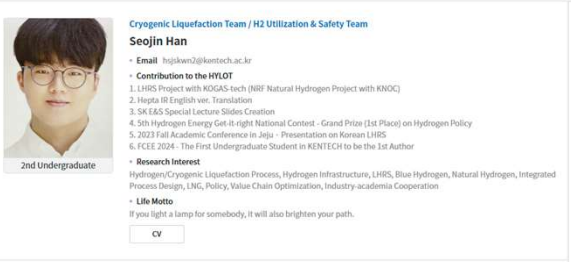




Hydrogen Utilization 연구팀

HYLOT

➢ SCI Subject 12 : Hydrogen Value Chain Optimization – LCA Perspectives



Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Seojin Han

- **Email** hsjskwn2@kentech.ac.kr
- **Contribution to the HYLOT**

1. LHRS Project with KOGAS-tech (NRF Natural Hydrogen Project with KNOC)
2. Hepta IR English ver. Translation
3. SK E&S Special Lecture Slides Creation
4. 5th Hydrogen Energy Get-it-right National Contest - Grand Prize (1st Place) on Hydrogen Policy
5. 2023 Fall Academic Conference in Jeju - Presentation on Korean LHRS
6. FCEE 2024 - The First Undergraduate Student in KENTECH to be the 1st Author

- **Research Interest**

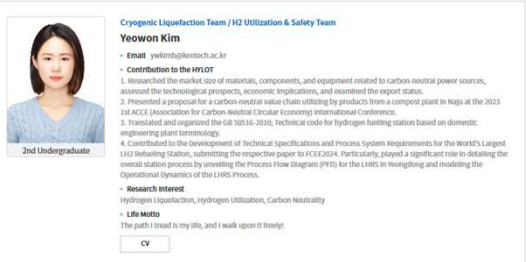
Hydrogen/Cryogenic Liquefaction Process, Hydrogen Infrastructure, LHRS, Blue Hydrogen, Natural Hydrogen, Integrated Process Design, LNG, Policy, Value Chain Optimization, Industry-academia Cooperation

- **Life Motto**

If you light a lamp for somebody, it will also brighten your path.

CV

2nd Undergraduate



Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Yeowon Kim

- **Email** ywkimb@kentech.ac.kr
- **Contribution to the HYLOT**

1. Researched the market size of materials, components, and equipment related to carbon-neutral power sources, assessed the technological prospects, economic implications, and examined the export status.
2. Presented a proposal for a carbon-neutral value chain utilizing by products from a compost plant in Naju at the 2023 1st ACCE (Association for Carbon-Neutral Circular Economy) International Conference.
3. Translated and organized the GB 50516-2010, Technical code for hydrogen fueling station based on domestic engineering plant terminology.
4. Contributed to the Development of Technical Specifications and Process System Requirements for the World's Largest LH2 Refueling Station, submitting the respective paper to FCEE2024. Particularly, played a significant role in detailing the overall station process by unveiling the Process Flow Diagram (PFD) for the LHRS in Yeongdong and modeling the Operational Dynamics of the LHRS Process.

- **Research Interest**

Hydrogen Liquefaction, Hydrogen Utilization, Carbon Neutrality

- **Life Motto**

The path I tread is my life, and I walk upon it freely!

CV

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Suhyun Ryu

- **Email** mellon777@kentech.ac.kr
- **Contribution to the HYLOT**

1. Conducted a survey on hydrogen mobility, assessed the current status of liquefied hydrogen refueling stations, researched LNG liquefaction processes, explored hydrogen liquefaction processes, studied distributed modeling for ammonia co-firing power generation, and conducted research on the development and production status of components related to liquefied hydrogen.

- **Research Interest**

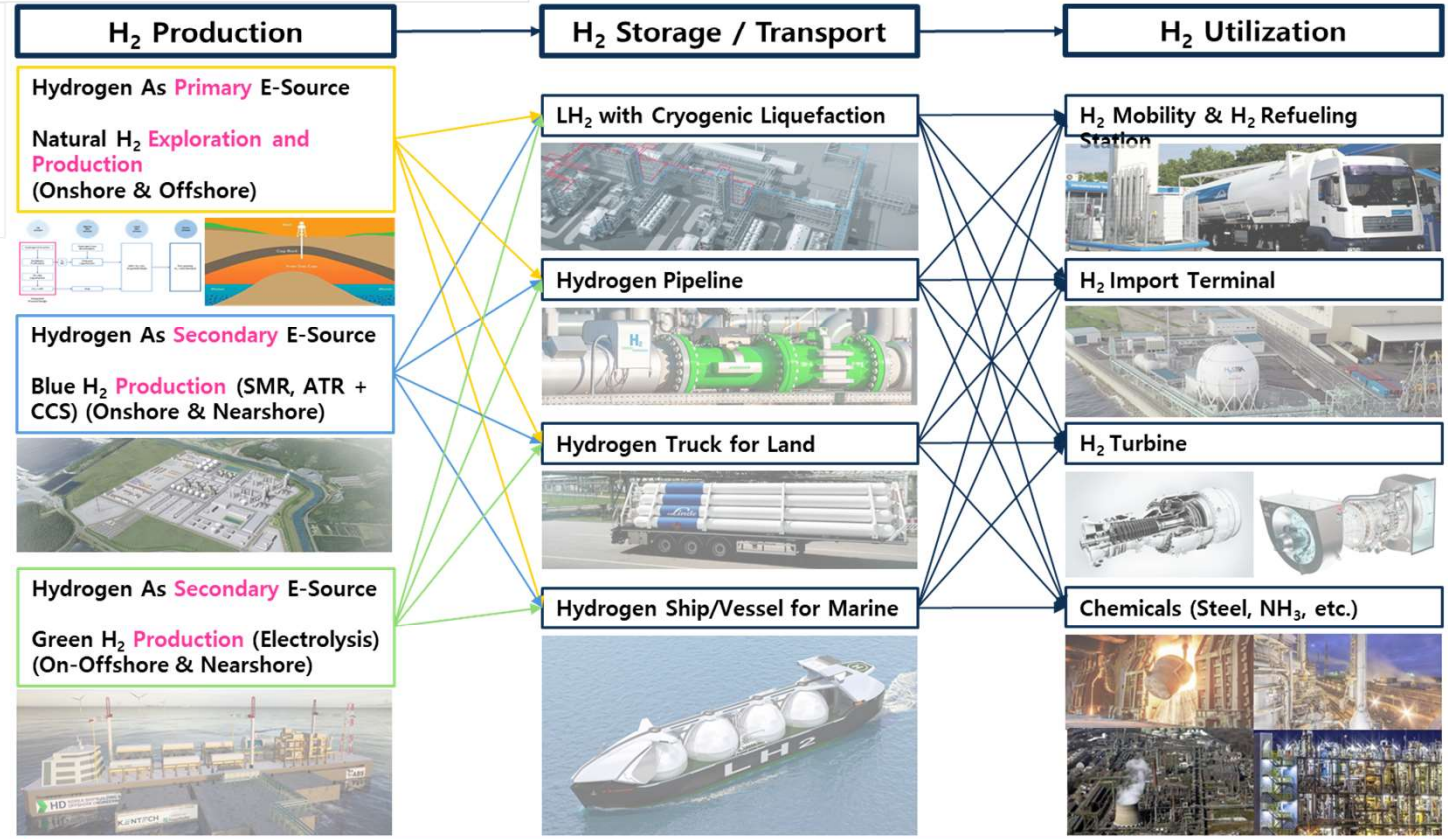
Blue Hydrogen, Green Hydrogen, White Hydrogen, Hydrogen Liquefaction Processes, Carbon Capture, Utilization, and Storage (CCUS).

- **Life Motto**

Let's strive to experience a wide range of opportunities. Let's always do my best in everything I've been given.

CV

2nd Undergraduate

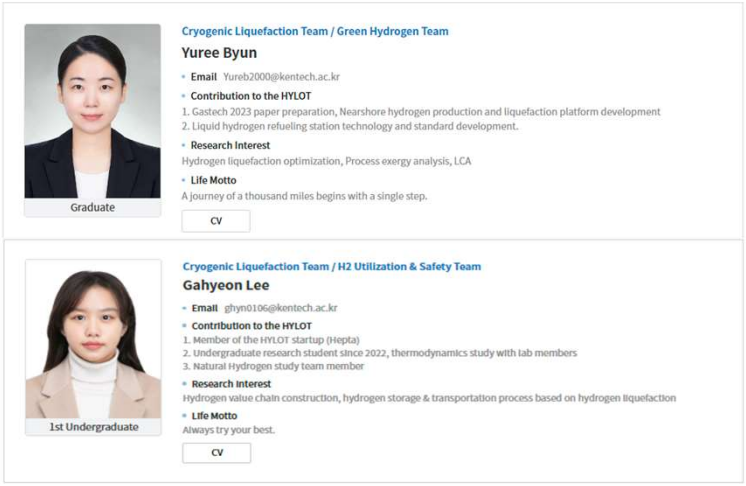


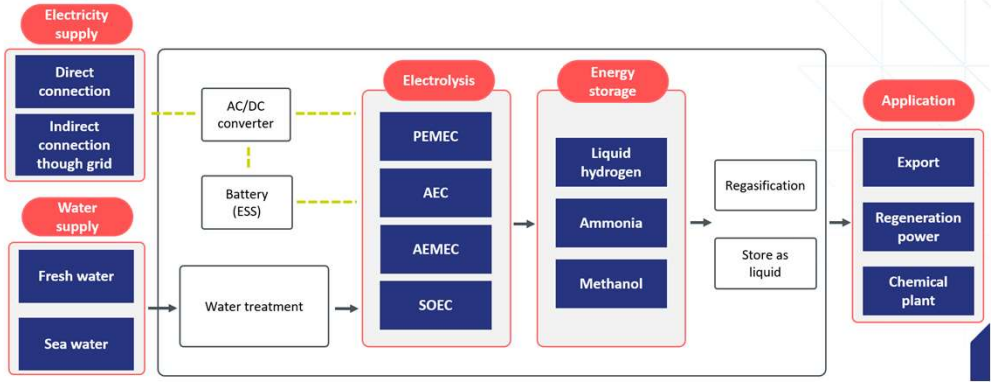
VII. 2024년 연구 과제

그린 수소 연구 과제

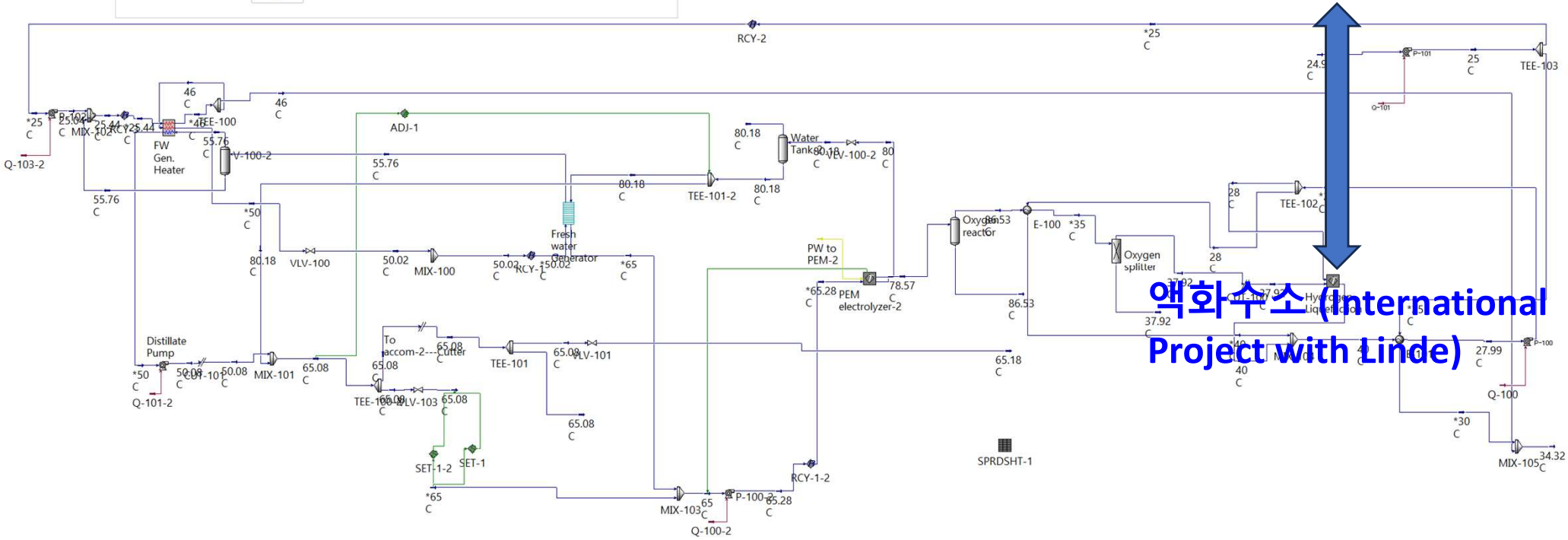
HYLOT

➢ 연구 과제 1 : Offshore / Nearshore Green Hydrogen Production / Storage (LH2 / Ammonia) Technology Development (발주처 : 신규 과제, BISTEP & 에기평 국제공동연구)





암모니아 (BISTEP Project)



액화수소 (International Project with Linde)

천연 수소 연구 과제

HYLOT

➢ 연구 과제 2 : Optimal Natural Hydrogen Process Development (발주처 : 신규과제, NRF (한국연구재단) 제안 예정)

Graduate

Cryogenic Liquefaction Team / Natural Hydrogen Team

Junseok Kim

- **Email** junseokkim@kentech.ac.kr
- **Contribution to the HYLOT**

1. Development of natural hydrogen liquefaction process technology

- **Research Interest**

H_2 Value Chain Technologies (Blue H_2(SMR + CCUS)), LH_2 Liquefier Technologies

- **Life Motto**

The regret after not doing something is far bigger than that of doing something.

CV

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Seojin Han

- **Email** hsjskwn2@kentech.ac.kr
- **Contribution to the HYLOT**

1. LHRS Project with KOGAS-tech (NRF Natural Hydrogen Project with KNOC)
2. Hepta IR English ver. Translation
3. SK E&S Special Lecture Slides Creation
4. 5th Hydrogen Energy Get-it-right National Contest - Grand Prize (1st Place) on Hydrogen Policy
5. 2023 Fall Academic Conference in Jeju - Presentation on Korean LHRS
6. FCEE 2024 - The First Undergraduate Student in KENTECH to be the 1st Author

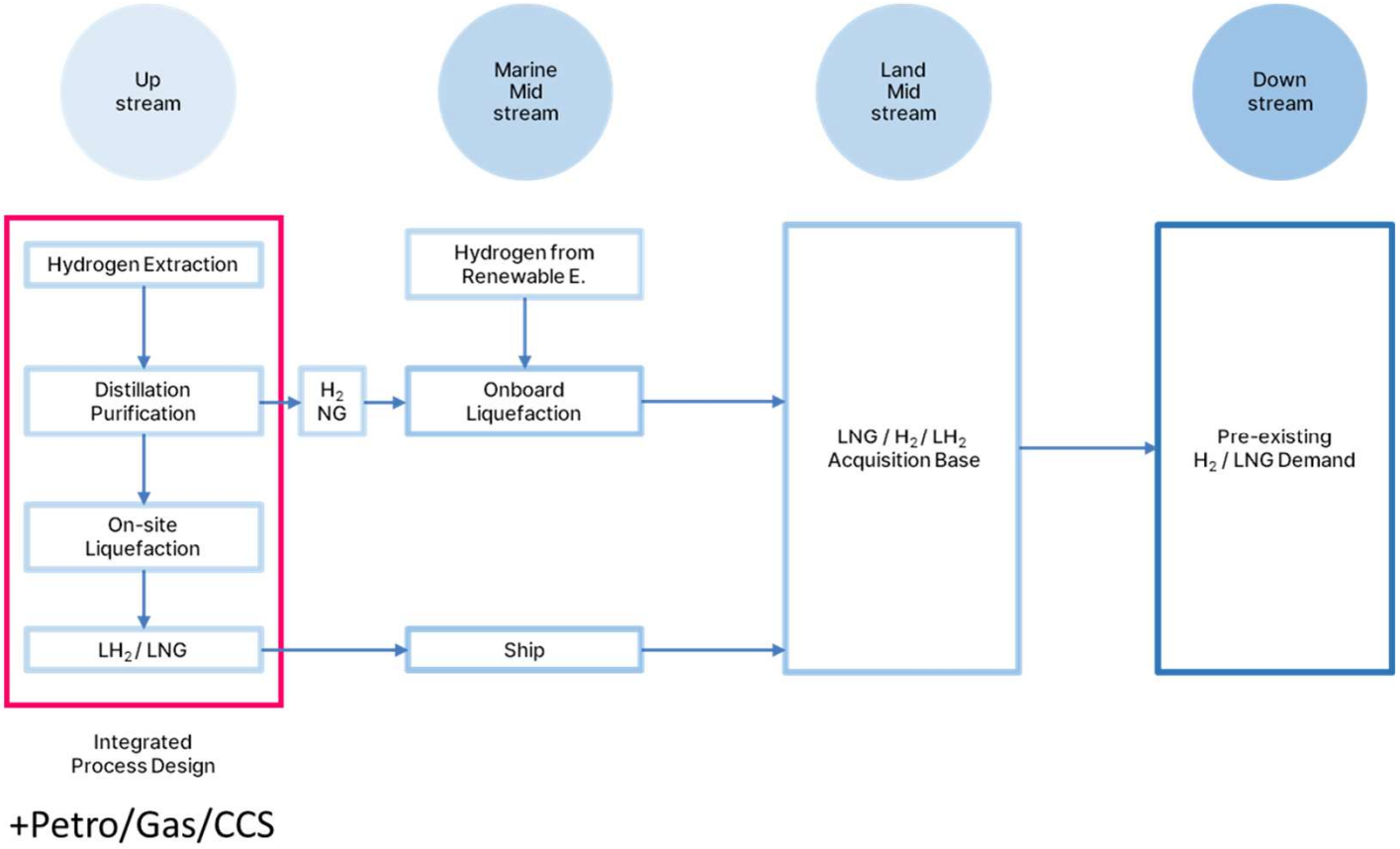
- **Research Interest**

Hydrogen/Cryogenic Liquefaction Process, Hydrogen Infrastructure, LHRS, Blue Hydrogen, Natural Hydrogen, Integrated Process Design, LNG, Policy, Value Chain Optimization, Industry-academia Cooperation

- **Life Motto**

If you light a lamp for somebody, it will also brighten your path.

CV



블루 수소 연구 과제

HYLOT

➢ 연구 과제 3 : Optimal Blue Hydrogen Process Development (발주처 : 신규과제, 한양 묘도 프로젝트 예정)

1st Undergraduate

Cryogenic Liquefaction Team / Blue Hydrogen Team

Seona Lee

- **Email** seonarayo@kentech.ac.kr
- **Contribution to the HYLOT**

1. CCUS technology paper review and thermodynamics group study

- **Research Interest**

blue hydrogen and CCS technology

- **Life Motto**

Don't look back.

CV

1st Undergraduate

Cryogenic Liquefaction Team / Blue Hydrogen Team

Seoyeon Yu

- **Email** westkite62@kentech.ac.kr
- **Contribution to the HYLOT**

1. Gastech 2023 thesis contributor
2. white hydrogen thesis research

- **Research Interest**

Blue H2

- **Life Motto**

in for a penny, in for a pound.

CV

묘도 에코에너지 허브 개요

위치	전남 여수 묘도 및 여수국가산업단지 일원
사업 내용	탄소 중립 생태계를 갖춘 에너지 생산·유통·활용 거점 구축
사업비	약 15조5000억원
사업 주체	전남도, 한양, GS에너지, 한국서부발전 등

극저온 액화 연구 과제

HYLOT

➢ 연구 과제 4 : Development of Original technology for large capacity hydrogen liquefaction linked with renewable energy (발주처 : 기존과제, 한전 전력연구원)

Graduate

Cryogenic Liquefaction Team / Green Hydrogen Team

Yuree Byun

- **Email** Yureb2000@kentech.ac.kr
- **Contribution to the HYLOT**

1. Gastech 2023 paper preparation, Nearshore hydrogen production and liquefaction platform development
2. Liquid hydrogen refueling station technology and standard development.

- **Research Interest**

Hydrogen liquefaction optimization, Process exergy analysis, LCA

- **Life Motto**

A journey of a thousand miles begins with a single step.

CV

1st Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Gahyeon Lee

- **Email** ghyn0106@kentech.ac.kr
- **Contribution to the HYLOT**

1. Member of the HYLOT startup (Hepta)
2. Undergraduate research student since 2022, thermodynamics study with lab members
3. Natural Hydrogen study team member

- **Research Interest**

Hydrogen value chain construction, hydrogen storage & transportation process based on hydrogen liquefaction

- **Life Motto**

Always try your best.

CV

1st Undergraduate

Cryogenic Liquefaction Team / Blue Hydrogen Team / H2 Utilization Team

Suhong Kim

- **Email** tnghd3207@kentech.ac.kr
- **Contribution to the HYLOT**

1. 2022 HRS (Hydrogen Refueling Station) current installation status research, CCUS technology paper review (Thermodynamics study with lab members)

- **Research Interest**

Hydrogen liquefaction process design from thermodynamic theories to practical applications, Liquid hydrogen application on various disciplines, Carbon capture technologies in chemical ways such as amine absorption and its process design

- **Life Motto**

Work hard, play hard!

CV

극저온 액화 연구 과제

➢ 연구 과제 5 : New Hydrogen Liquefaction Process Cycle Development (발주처 : 신규과제, KRISO)

Graduate

Cryogenic Liquefaction Team / Natural Hydrogen Team

Yesom Yun

- **Email** yesomy@kentech.ac.kr
- **Contribution to the HYLOT**

1. Cryogenic Liquefaction Technology Development, Natural Hydrogen Value Chain Development

- **Life Motto**

If it seems not bad, just begin. It becomes a valuable experience regardless of success or failure.

CV

1st Undergraduate

Cryogenic Liquefaction Team / Blue Hydrogen Team / H2 Utilization Team

Suhong Kim

- **Email** tnghd3207@kentech.ac.kr
- **Contribution to the HYLOT**

1. 2022 HRS (Hydrogen Refueling Station) current installation status research, CCUS technology paper review (Thermodynamics study with lab members)

- **Research Interest**

Hydrogen liquefaction process design from thermodynamic theories to practical applications, Liquid hydrogen application on various disciplines, Carbon capture technologies in chemical ways such as amine absorption and its process design

- **Life Motto**

Work hard, play hard!

CV

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Suhyun Ryu

- **Email** mellon777@kentech.ac.kr
- **Contribution to the HYLOT**

1. Conducted a survey on hydrogen mobility, assessed the current status of liquefied hydrogen refueling stations, researched LNG liquefaction processes, explored hydrogen liquefaction processes, studied distributed modeling for ammonia co-firing power generation, and conducted research on the development and production status of components related to liquefied hydrogen.

- **Research Interest**

Blue Hydrogen, Green Hydrogen, White Hydrogen, Hydrogen Liquefaction Processes, Carbon Capture, Utilization, and Storage (CCUS).

- **Life Motto**

Let's strive to experience a wide range of opportunities. Let's always do my best in everything I've been given.

CV

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Yeowon Kim

- **Email** ywkimb@kentech.ac.kr
- **Contribution to the HYLOT**

1. Researched the market size of materials, components, and equipment related to carbon-neutral power sources, assessed the technological prospects, economic implications, and examined the export status.
2. Presented a proposal for a carbon-neutral value chain utilizing by products from a compost plant in Naju at the 2023 1st ACCE (Association for Carbon-Neutral Circular Economy) International Conference.
3. Translated and organized the GB 50516-2010; Technical code for hydrogen fuelling station based on domestic engineering plant terminology.
4. Contributed to the Development of Technical Specifications and Process System Requirements for the World's Largest LH2 Refueling Station, submitting the respective paper to FCEE2024. Particularly, played a significant role in detailing the overall station process by unveiling the Process Flow Diagram (PFD) for the LHRS in Yeongdong and modeling the Operational Dynamics of the LHRS Process.

- **Research Interest**

Hydrogen Liquefaction, Hydrogen Utilization, Carbon Neutrality

- **Life Motto**

The path I tread is my life, and I walk upon it freely!

CV

○ **Linde-Hampson**

: Compressor, Heat exchanger, Joule-Thomson valve

○ **Claude**

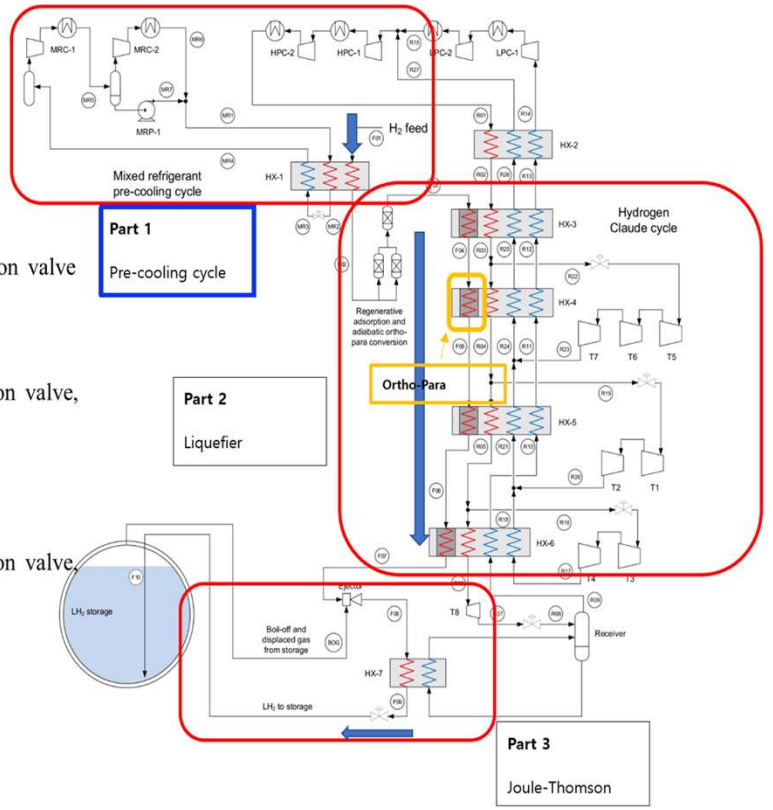
: Compressor, Heat exchanger, Joule-Thomson valve,

Expander

○ **Pre-cooled Claude**

: Compressor, Heat exchanger, Joule-Thomson valve,

Expander, Pre-cooling system



CCS 연구 과제

HYLOT

➢ 연구 과제 6 : Onboard CCS development (발주처 : 기존과제, KRISO)

2nd Undergraduate

Cryogenic Liquefaction Team / CCS Team

Hyunhwa Lee

- **Email** lhhjsjs@kentech.ac.kr
- **Contribution to the HYLOT**

1. Onboard Carbon Capture Technology with KRISO

- **Research Interest**

Carbon Capture/Utilization/Storage Technology, Blue Hydrogen, Green Hydrogen, Hydrogen Liquefaction Process, Hydrogen Cycle Process

- **Life Motto**

When life gives you lemons, make the lemonade.

CV

2nd Undergraduate

Cryogenic Liquefaction Team / CCS Team

Minki Jung

- **Email** jmk8643@kentech.ac.kr
- **Contribution to the HYLOT**

1. Onboard Carbon Capture Technology with KRISO

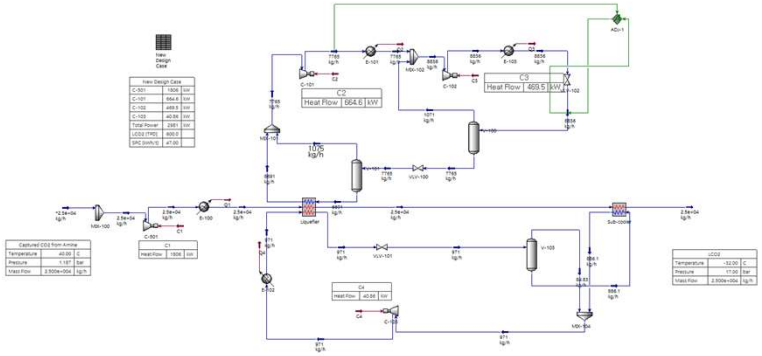
- **Research Interest**

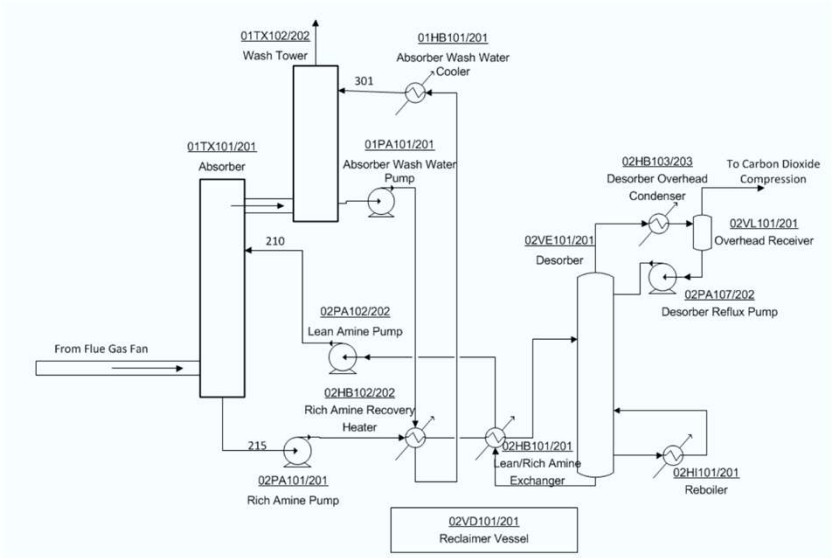
Carbon Capture/Utilization/Storage Technology, Green Hydrogen, Fuel cell, Hydrogen Liquefaction Process

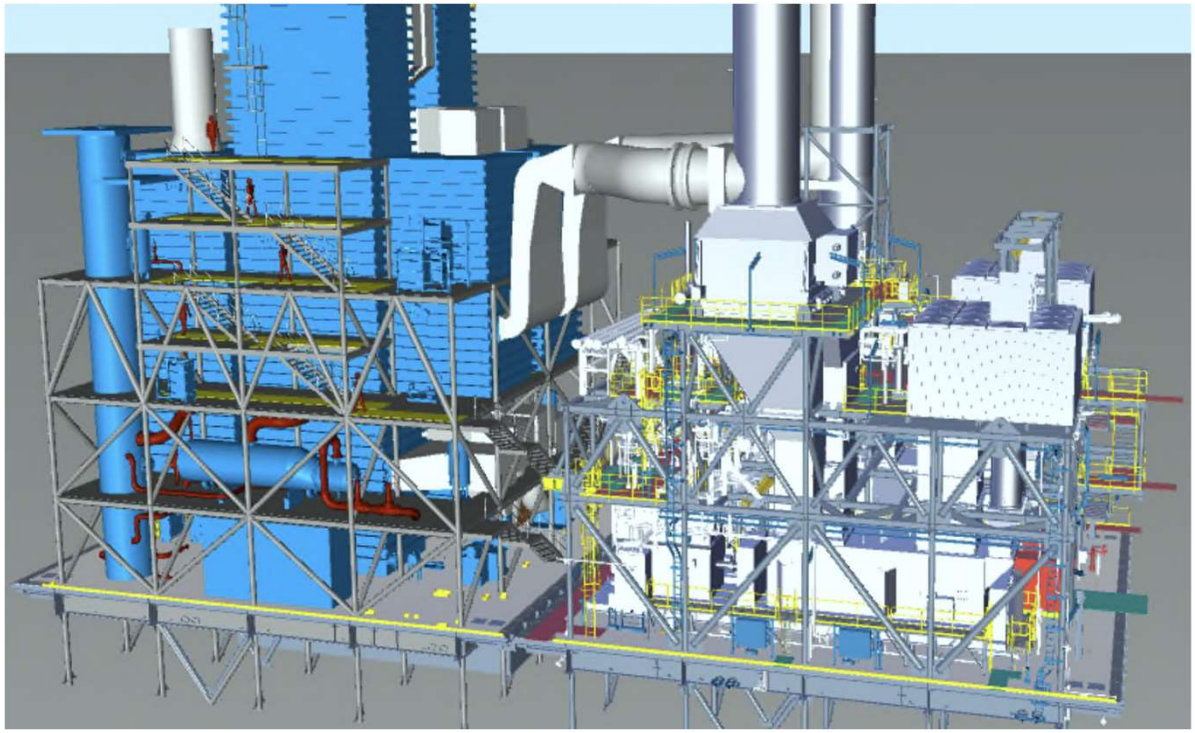
- **Life Motto**

With great power comes great responsibility.

CV



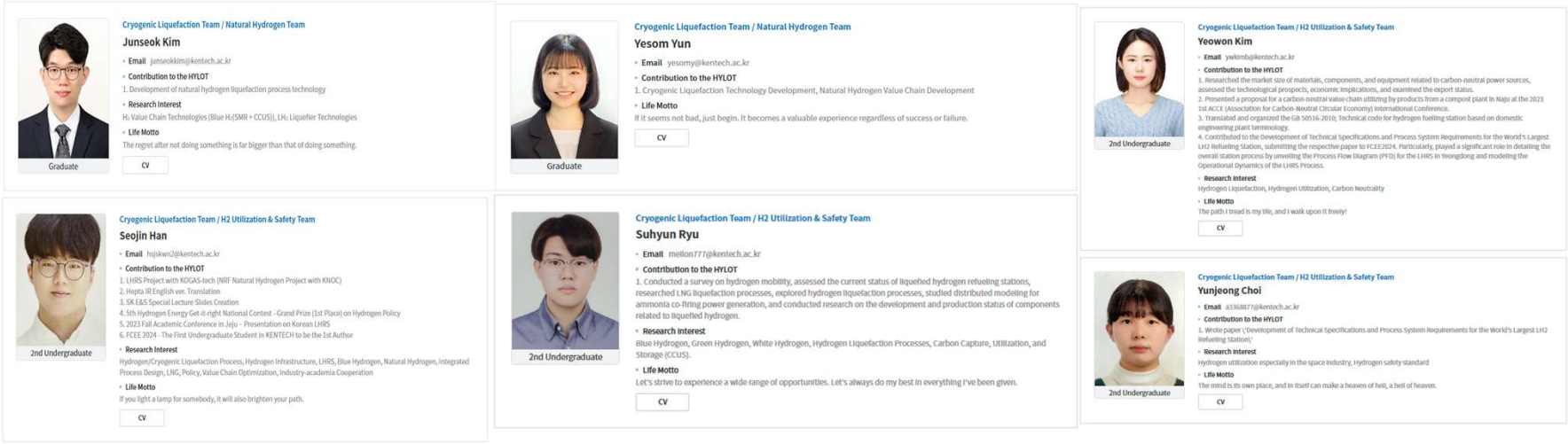




Hydrogen Utilization 연구 과제

HYLOT

➢ 연구 과제 7 : LH2 Refueling Station Development (발주처 : 기존과제, KETEP) – 최고 펀딩 프로젝트



Cryogenic Liquefaction Team / Natural Hydrogen Team
Junseok Kim
- Email junseokkim@kentech.ac.kr
- Contribution to the HYLOT
1. Development of natural hydrogen liquefaction process technology
- Research Interest
H_2 Value Chain Technologies (Blue H_2(SMR + CCUS)), LH_2 Liquefier Technologies
- Life Motto
The regret after not doing something is far bigger than that of doing something.

CV

Graduate

Cryogenic Liquefaction Team / Natural Hydrogen Team
Yesom Yun
- Email yesomy@kentech.ac.kr
- Contribution to the HYLOT
1. Cryogenic Liquefaction Technology Development, Natural Hydrogen Value Chain Development
- Life Motto
If it seems not bad, just begin. It becomes a valuable experience regardless of success or failure.

CV

Graduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team
Yeowon Kim
- Email ywkimb@kentech.ac.kr
- Contribution to the HYLOT
1. Researched the market size of materials, components, and equipment related to carbon-neutral power sources, assessed the technological prospects, economic implications, and examined the export status.
2. Presented a proposal for a carbon-neutral value chain utilizing by products from a compost plant in Naju at the 2023 1st ACCE (Association for Carbon-Neutral Circular Economy) International Conference.
3. Translated and organized the GB 50516-2010; Technical code for hydrogen fueling station based on domestic engineering plant terminology.
4. Contributed to the Development of Technical Specifications and Process System Requirements for the World's Largest LH2 Refueling Station, submitting the respective paper to FCEE2024. Particularly, played a significant role in detailing the overall station process by unveiling the Process Flow Diagram (PFD) for the LHRS in Yeongdong and modeling the Operational Dynamics of the LHRS Process.
- Research Interest
Hydrogen Liquefaction, Hydrogen Utilization, Carbon Neutrality
- Life Motto
The path I tread is my life, and I walk upon it freely!

CV

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team
Seojin Han
- Email hsjskwn2@kentech.ac.kr
- Contribution to the HYLOT
1. LHRS Project with KOGAS-tech (NRF Natural Hydrogen Progect Project with KNOC)
2. Hepta IR English ver. Translation
3. SK E&S Special Lecture Slides Creation
4. 5th Hydrogen Energy Get-it-right National Contest - Grand Prize (1st Place) on Hydrogen Policy
5. 2023 Fall Academic Conference in Jeju - Presentation on Korean LHRS
6. FCEE 2024 - The First Undergraduate Student in KENTECH to be the 1st Author
- Research Interest
Hydrogen/Cryogenic Liquefaction Process, Hydrogen Infrastructure, LHRS, Blue Hydrogen, Natural Hydrogen, Integrated Process Design, LNG, Policy, Value Chain Optimization, Industry-academia Cooperation
- Life Motto
If you light a lamp for somebody, it will also brighten your path.

CV

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team
Suhyun Ryu
- Email mellon777@kentech.ac.kr
- Contribution to the HYLOT
1. Conducted a survey on hydrogen mobility, assessed the current status of liquefied hydrogen refueling stations, researched LNG liquefaction processes, explored hydrogen liquefaction processes, studied distributed modeling for ammonia co-firing power generation, and conducted research on the development and production status of components related to liquefied hydrogen.
- Research Interest
Blue Hydrogen, Green Hydrogen, White Hydrogen, Hydrogen Liquefaction Processes, Carbon Capture, Utilization, and Storage (CCUS).
- Life Motto
Let's strive to experience a wide range of opportunities. Let's always do my best in everything I've been given.

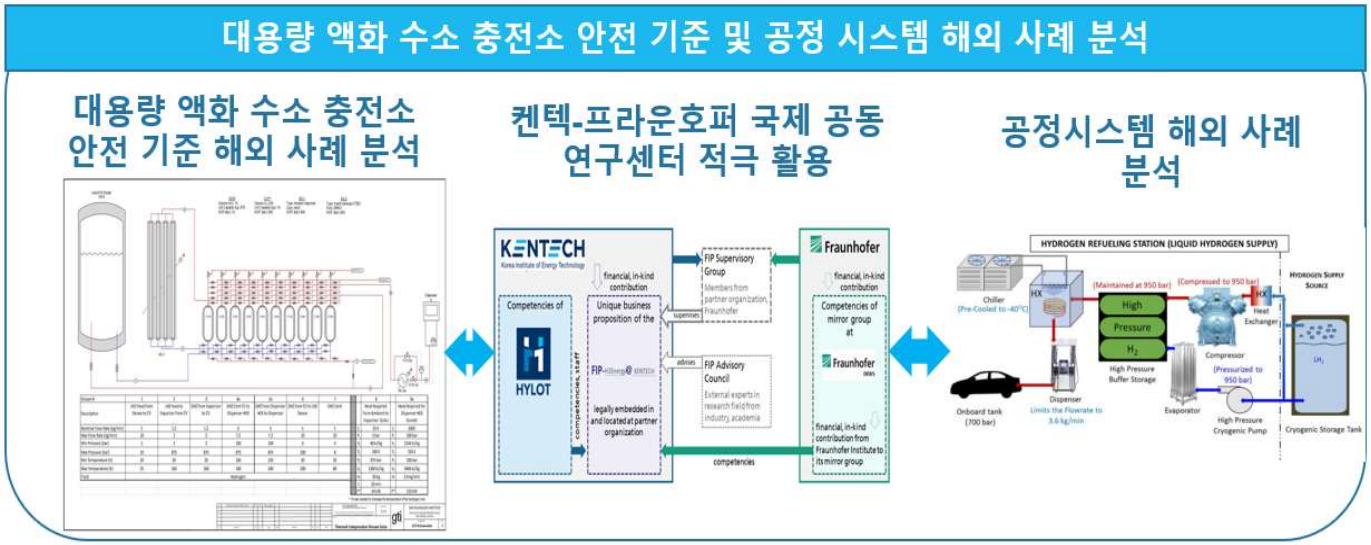
CV

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team
Yunjeong Choi
- Email a3368877@kentech.ac.kr
- Contribution to the HYLOT
1. Wrote paper \'Development of Technical Specifications and Process System Requirements for the World's Largest LH2 Refueling Station\'
- Research Interest
Hydrogen utilization especially in the space industry, Hydrogen safety standard
- Life Motto
The mind is its own place, and in itself can make a heaven of hell, a hell of heaven.

CV

2nd Undergraduate



Hydrogen Utilization 연구 과제

HYLOT

➢ 연구 과제 8 : LH2 Value Chain Development (발주처 : 기존과제, P3 Group)

Graduate

Cryogenic Liquefaction Team / Green Hydrogen Team

Yuree Byun

- **Email** Yureb2000@kentech.ac.kr
- **Contribution to the HYLOT**

1. Gastech 2023 paper preparation, Nearshore hydrogen production and liquefaction platform development
2. Liquid hydrogen refueling station technology and standard development.

- **Research Interest**

Hydrogen liquefaction optimization, Process exergy analysis, LCA

- **Life Motto**

A journey of a thousand miles begins with a single step.

CV

Graduate

Cryogenic Liquefaction Team / Natural Hydrogen Team

Junseok Kim

- **Email** junseokkim@kentech.ac.kr
- **Contribution to the HYLOT**

1. Development of natural hydrogen liquefaction process technology

- **Research Interest**

H_2 Value Chain Technologies (Blue H_2(SMR + CCUS)), LH_2 Liquefier Technologies

- **Life Motto**

The regret after not doing something is far bigger than that of doing something.

CV

Graduate

Cryogenic Liquefaction Team / Natural Hydrogen Team

Yesom Yun

- **Email** yesomy@kentech.ac.kr
- **Contribution to the HYLOT**

1. Cryogenic Liquefaction Technology Development, Natural Hydrogen Value Chain Development

- **Life Motto**

If it seems not bad, just begin. It becomes a valuable experience regardless of success or failure.

CV

P3

Interim Report to P3

2023.12.22 (Friday)
ONLINE

Korea Institute of Energy Technology (KENTECH)
Prof. Jihyun Hwang

Hydrogen Utilization 연구 과제

HYLOT

➢ 연구 과제 9 : Ammonia Co-Firing Safety Development (발주처 : 기존과제, KETEP)

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Suhyun Ryu

- **Email** melion777@kentech.ac.kr
- **Contribution to the HYLOT**

1. Conducted a survey on hydrogen mobility, assessed the current status of liquefied hydrogen refueling stations, researched LNG liquefaction processes, explored hydrogen liquefaction processes, studied distributed modeling for ammonia co-firing power generation, and conducted research on the development and production status of components related to liquefied hydrogen.

- **Research Interest**

Blue Hydrogen, Green Hydrogen, White Hydrogen, Hydrogen Liquefaction Processes, Carbon Capture, Utilization, and Storage (CCUS).

- **Life Motto**

Let's strive to experience a wide range of opportunities. Let's always do my best in everything I've been given.

CV

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Yeowon Kim

- **Email** ywkimb@kentech.ac.kr
- **Contribution to the HYLOT**

1. Researched the market size of materials, components, and equipment related to carbon-neutral power sources, assessed the technological prospects, economic implications, and examined the export status.
2. Presented a proposal for a carbon-neutral value chain utilizing by products from a compost plant in Naju at the 2023 1st ACCE (Association for Carbon-Neutral Circular Economy) International Conference.
3. Translated and organized the GB 50516-2010; Technical code for hydrogen fuelling station based on domestic engineering plant terminology.
4. Contributed to the Development of Technical Specifications and Process System Requirements for the World's Largest LH2 Refueling Station, submitting the respective paper to FCEE2024. Particularly, played a significant role in detailing the overall station process by unveiling the Process Flow Diagram (PFD) for the LHRS in Yeongdong and modeling the Operational Dynamics of the LHRS Process.

- **Research Interest**

Hydrogen Liquefaction, Hydrogen Utilization, Carbon Neutrality

- **Life Motto**

The path I tread is my life, and I walk upon it freely!

CV

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Yunjeong Choi

- **Email** a3368877@kentech.ac.kr
- **Contribution to the HYLOT**

1. Wrote paper \'Development of Technical Specifications and Process System Requirements for the World's Largest LH2 Refueling Station\'

- **Research Interest**

Hydrogen utilization especially in the space industry, Hydrogen safety standard

- **Life Motto**

The mind is its own place, and in itself can make a heaven of hell, a hell of heaven.

CV

2nd Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Seojin Han

- **Email** hsjskwn2@kentech.ac.kr
- **Contribution to the HYLOT**

1. LHRS Project with KOGAS-tech (NRF Natural Hydrogen Project with KNOC)
2. Hepta IR English ver. Translation
3. SK E&S Special Lecture Slides Creation
4. 5th Hydrogen Energy Get-it-right National Contest - Grand Prize (1st Place) on Hydrogen Policy
5. 2023 Fall Academic Conference in Jeju · Presentation on Korean LHRS
6. FCEE 2024 - The First Undergraduate Student in KENTECH to be the 1st Author

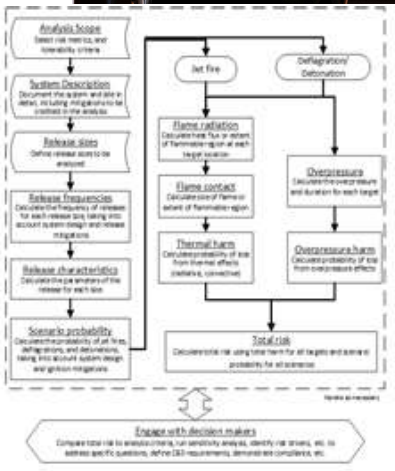
- **Research Interest**

Hydrogen/Cryogenic Liquefaction Process, Hydrogen Infrastructure, LHRS, Blue Hydrogen, Natural Hydrogen, Integrated Process Design, LNG, Policy, Value Chain Optimization, Industry-academia Cooperation

- **Life Motto**

If you light a lamp for somebody, it will also brighten your path.

CV



Hydrogen Utilization 연구 과제

HYLOT

➢ 연구 과제 10 : LH_2 Import Terminal Development (발주처 : 기존과제, 유신 & 동서발전)

Graduate

Cryogenic Liquefaction Team / Natural Hydrogen Team

Yesom Yun

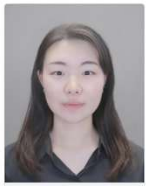
- **Email** yesomy@kentech.ac.kr
- **Contribution to the HYLOT**

1. Cryogenic Liquefaction Technology Development, Natural Hydrogen Value Chain Development

- **Life Motto**

If it seems not bad, just begin. It becomes a valuable experience regardless of success or failure.

CV



Winter-Semester Intern

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Jiwoon Song

- **Email** thdwldns@snu.ac.kr
- **Contribution to the HYLOT**

1. Intern
2. Liquid hydrogen BOG (Boil-Off Gas) process development from LH2 storage tanks

- **Research Interest**

LH2/LNG Cryogenic Liquefaction Process Optimization, LH2 Tanks Design, Wind Turbine

CV

1st Undergraduate

Cryogenic Liquefaction Team / Blue Hydrogen Team / H2 Utilization Team

Suhong Kim

- **Email** tnghd3207@kentech.ac.kr
- **Contribution to the HYLOT**

1. 2022 HRS (Hydrogen Refueling Station) current installation status research, CCUS technology paper review (Thermodynamics study with lab members)

- **Research Interest**

Hydrogen liquefaction process design from thermodynamic theories to practical applications, Liquid hydrogen application on various disciplines, Carbon capture technologies in chemical ways such as amine absorption and its process design

- **Life Motto**

Work hard, play hard!

CV

1st Undergraduate

Cryogenic Liquefaction Team / H2 Utilization & Safety Team

Gahyeon Lee

- **Email** ghyn0106@kentech.ac.kr
- **Contribution to the HYLOT**

1. Member of the HYLOT startup (Hepta)
2. Undergraduate research student since 2022, thermodynamics study with lab members
3. Natural Hydrogen study team member

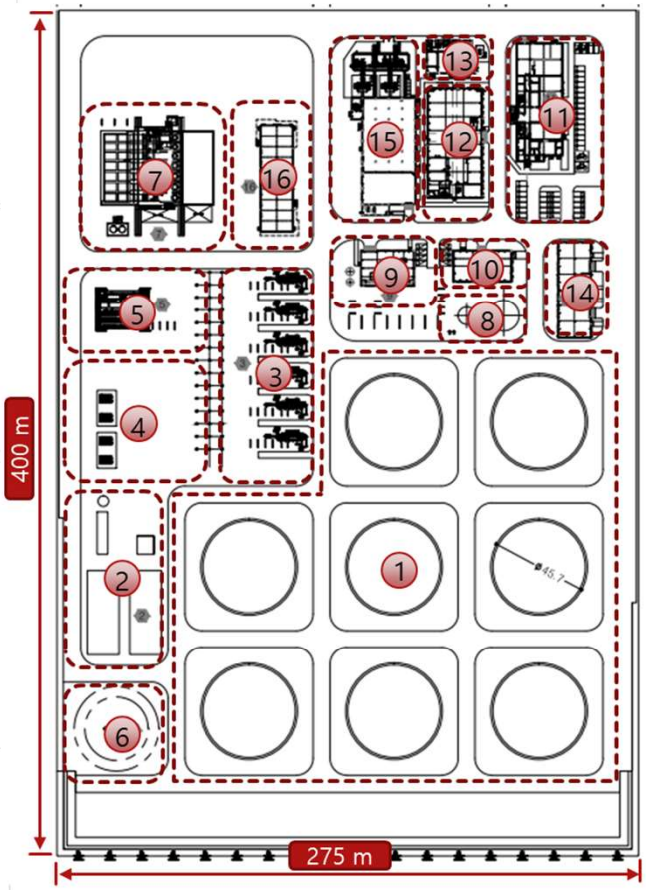
- **Research Interest**

Hydrogen value chain construction, hydrogen storage & transportation process based on hydrogen liquefaction

- **Life Motto**

Always try your best.

CV



NO.	Description
1	LH2 Storage Tank Area
2	BOG liquefaction system
3	Vaporizer System
4	Refrigeration System
5	Send-out System
6	Flare system
7	Sea Water Intake System
8	Industrial & Potable Water System
9	Air Compressor Room
10	Fire Fighting System
11	Admin. BLDG
12	Maintenance House
13	Laboratory Building
14	Warehouse
15	Main Station
16	Sub Station

HYLOT

감사합니다.