

고속열차 인터페이스

(공기역학 분야)

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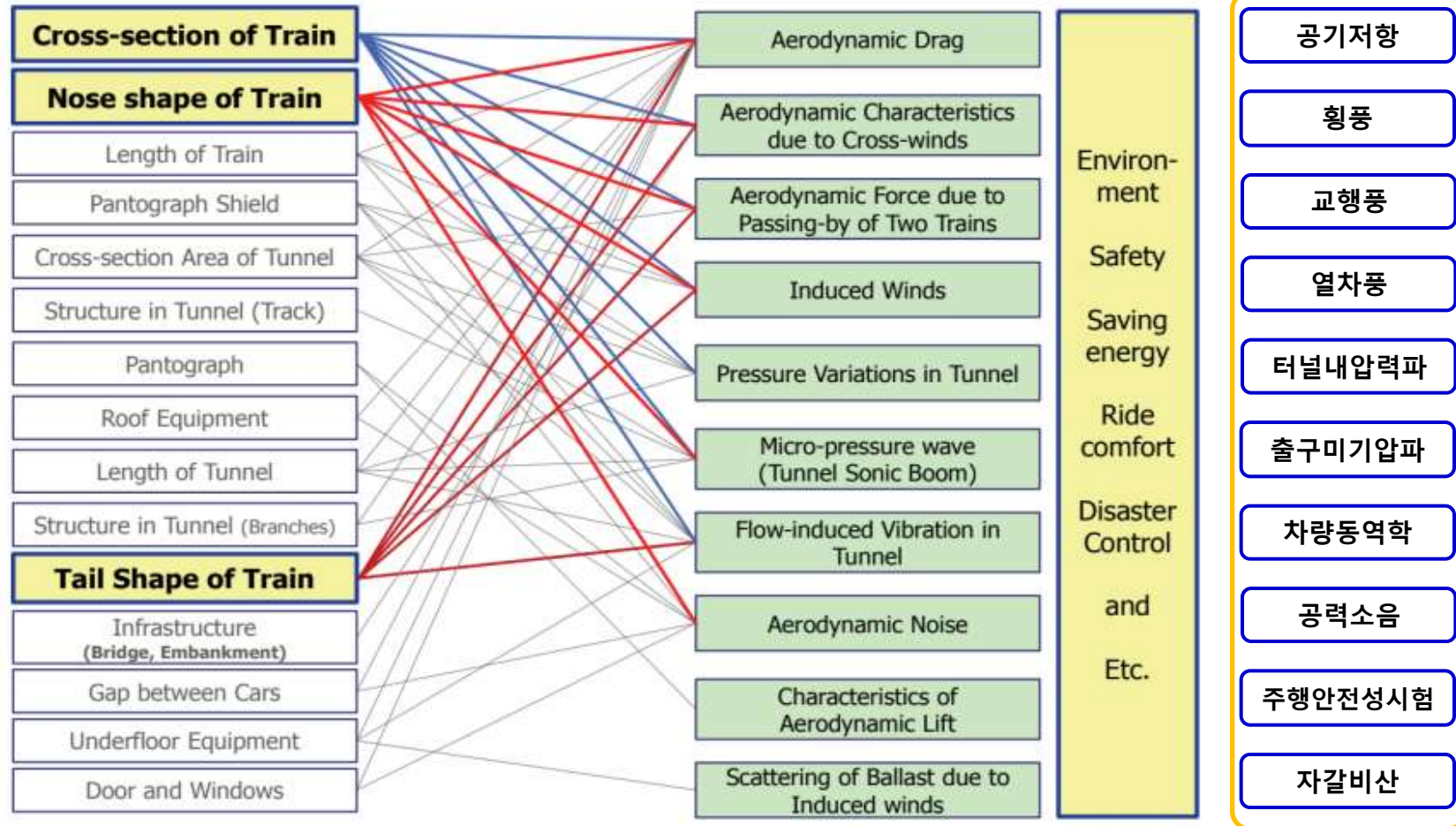
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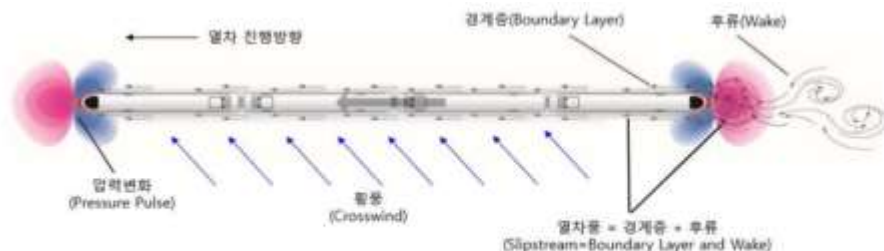
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고속열차 공기역학 인터페이스 (Aerodynamic interface on High speed train)



Ref. 여객/화물 복합열차 HSB의 터널 공력특성에 대한 시뮬레이션 연구 [한국유체기계학회 논문집: 제17권, 제5호, 노주현, 2014]

고속열차 공기역학 특성 (Aerodynamic characteristics on High speed train)



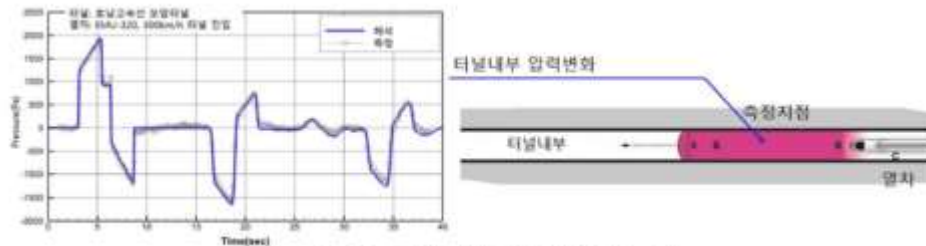
<개활지运行时 열차주변 공기역학적 특성>



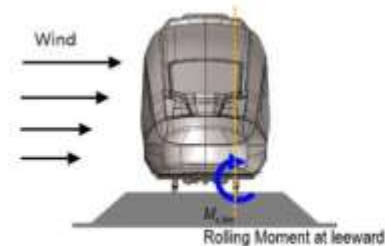
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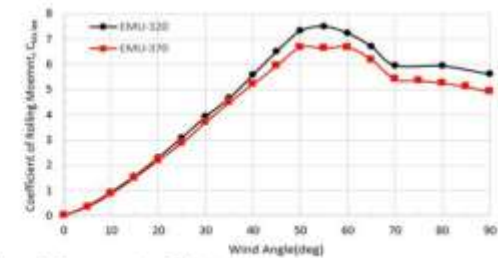
<EMU-370 축소모형>



<터널运行时 터널내부 압력변화 특성>



<롤링모멘트(Rolling Moment) 비교>



Ref. 철도경제신문 : <https://www.redaily.co.kr/news/articleView.html?idxno=10127>

유체역학과 철도공기역학

(Fluid dynamics and Railroad aerodynamics)

❖ Fluid dynamics

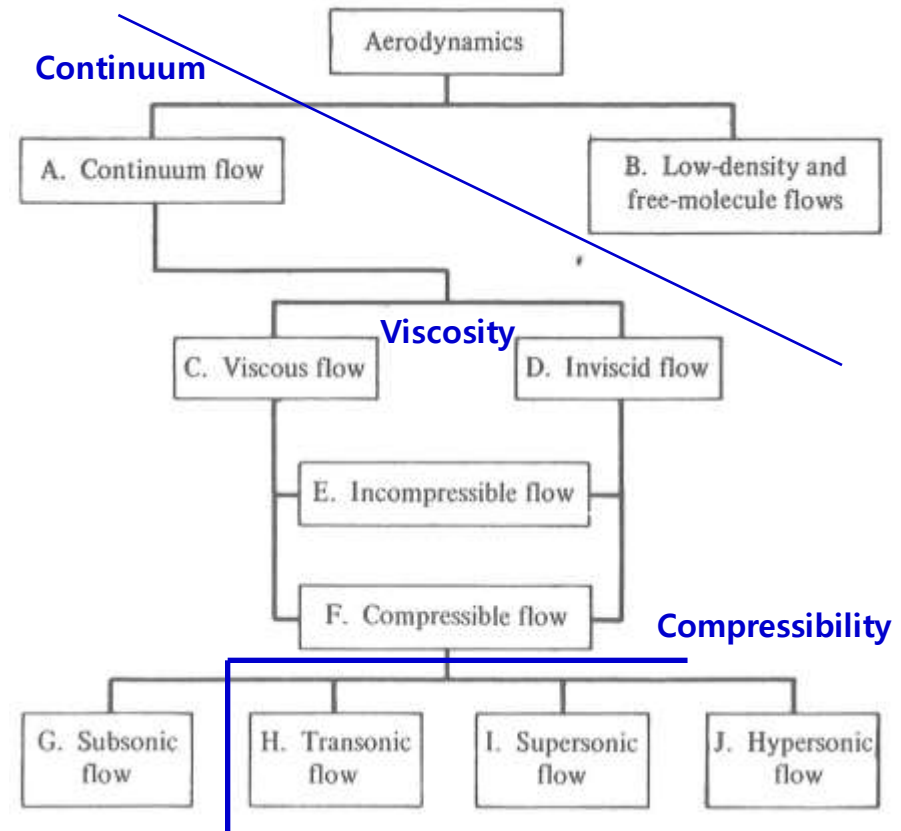
- Definitions and basic concepts
- Fundamental principles and equations
- Inviscid and incompressible flow
- Viscous flow and Turbulent flow
- Effect of compressibility

❖ Vehicle aerodynamics

- Aerospace aerodynamic and wing theory
- Automobile aerodynamics
- Railway train aerodynamics and HVAC

❖ Environmental aerodynamics on railroad

- Aerodynamics with infrastructures
- Fire and Evacuation simulation
- Aeroacoustics (tunnel pressure wave etc.)
- Echo friendly HVAC



Block diagram categorizing the types of aerodynamic flows
[John D. Anderson, Jr., Fundamentals of aerodynamics, 1991]

고속열차 비압축성 공기역학과 유동 제어 (incompressible aerodynamic and Flow vortex controls)

❖ Anti-icing and drag reduction vortex generator for train wheel bogie



❖ Air curtain and aerodynamic skirt for automobile and train

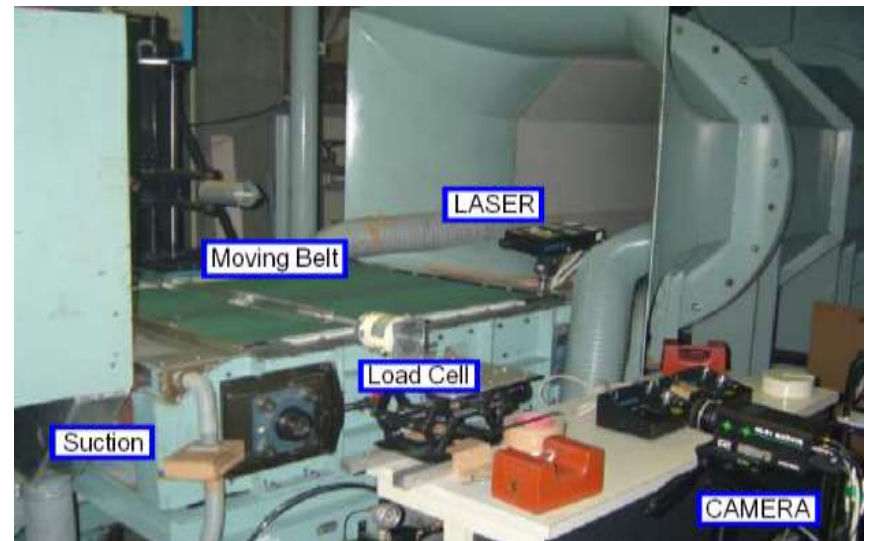
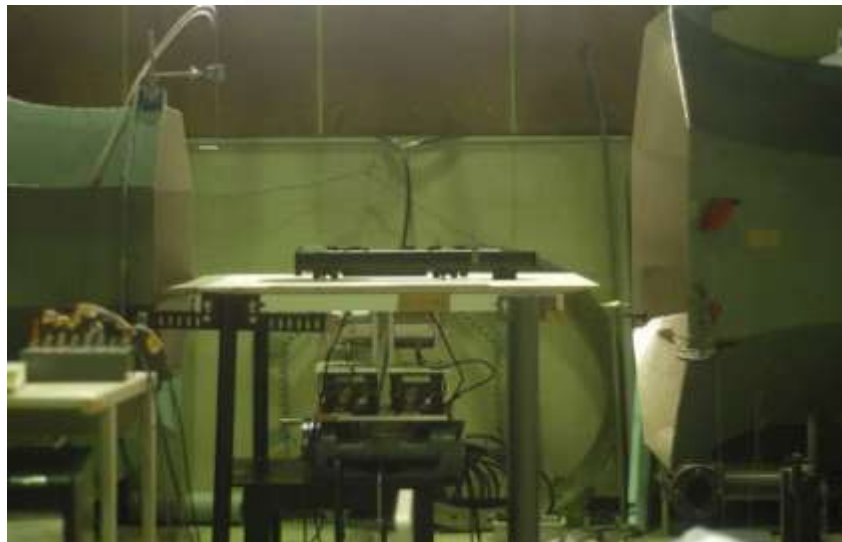
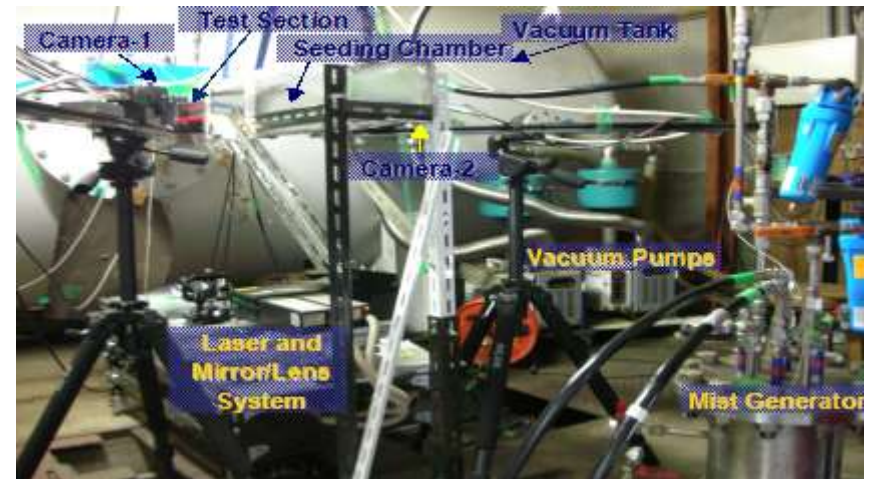
- Aerodynamics(CFD & Wind tunnel test) + Optimization



고속열차 축소모델 공기역학 시험

(Aerodynamic drag, Ground effect, Vacuum tunnel model tests)

❖ Wind tunnel in Tohoku Univ.



축소모델 비정상상태 및 소음 풍동 시험

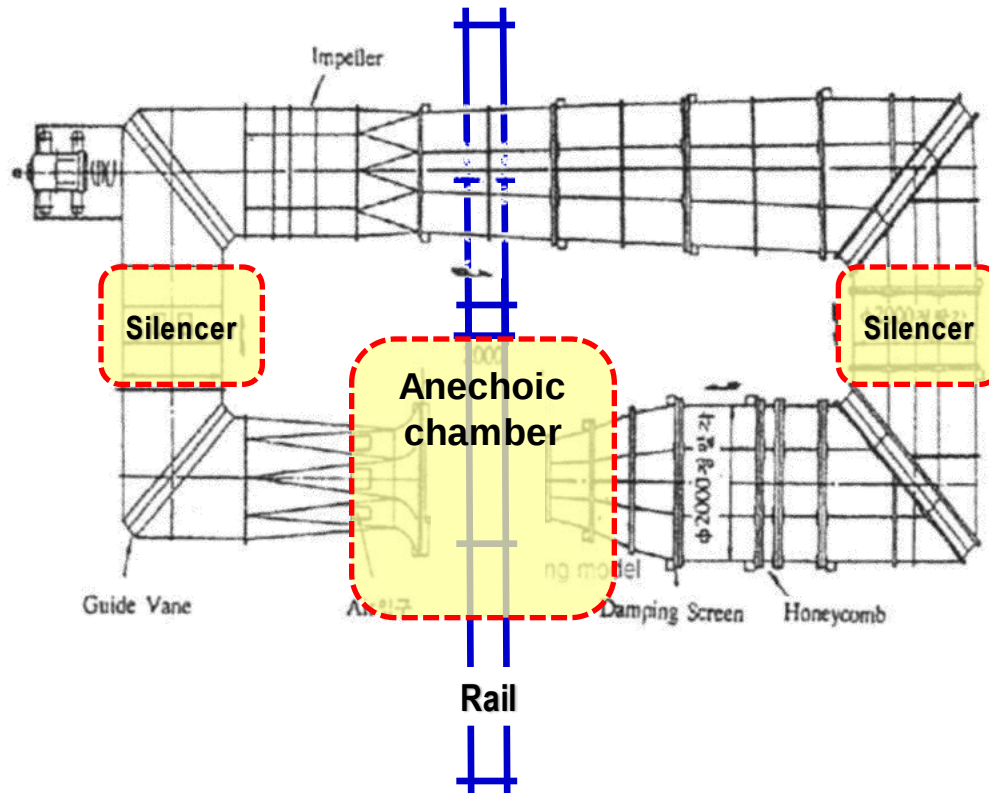
(Unsteady flow and aniconic wind tunnel tests with scaled model)

❖ Subsonic Gust wind tunnel

- Dynamic stability for aerospace vehicles and ground vehicles
- Drone, High speed trains, automobiles, bike and etc.

❖ Low noise anechoic chamber wind tunnel

- Aero vehicles acoustics test



고속열차 압축성 공기역학과 하이퍼 튜브 트레인 (Compressible aerodynamics and Hyperloop train)

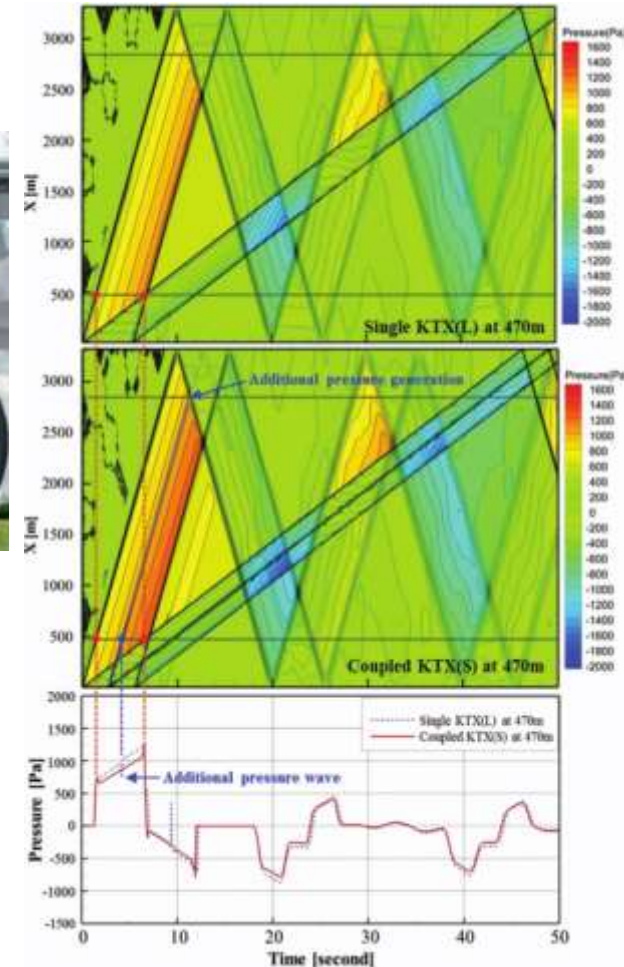
❖ Hyperloop train system concept design

- Aerodynamics + System engineering + Project developing



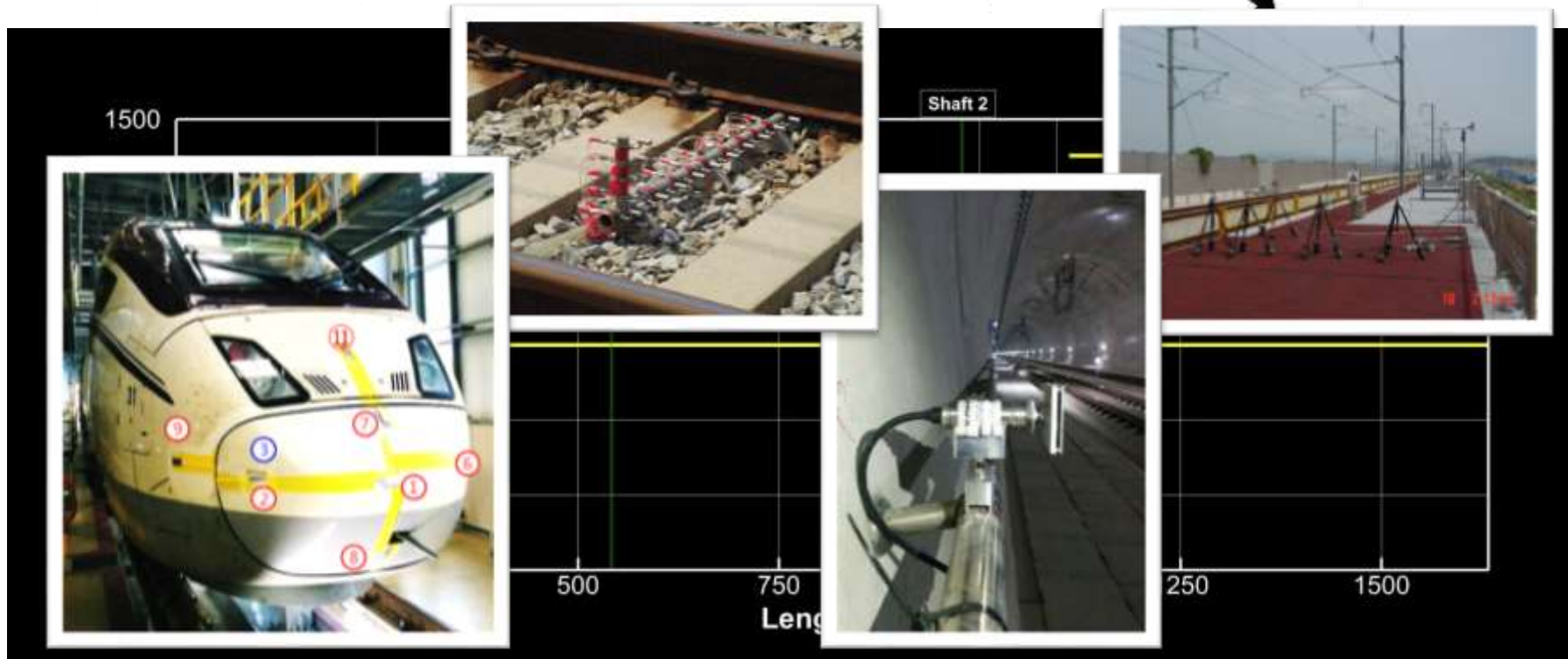
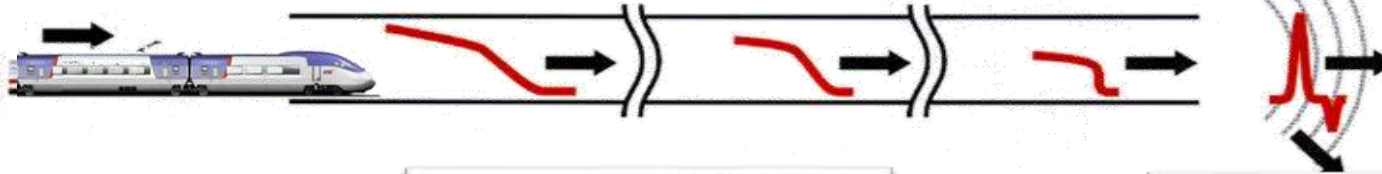
❖ Pressurization device for running in narrow tunnel [2]

- Compressible Aerodynamics + Big data + Surrogate model



고속열차 압축성 공기역학과 터널 압력파 시험 (Compressible aerodynamics and Tunnel pressure waves)

❖ High Speed Train Performance Test (Aerodynamics, Pressure wave, Noise, etc.)

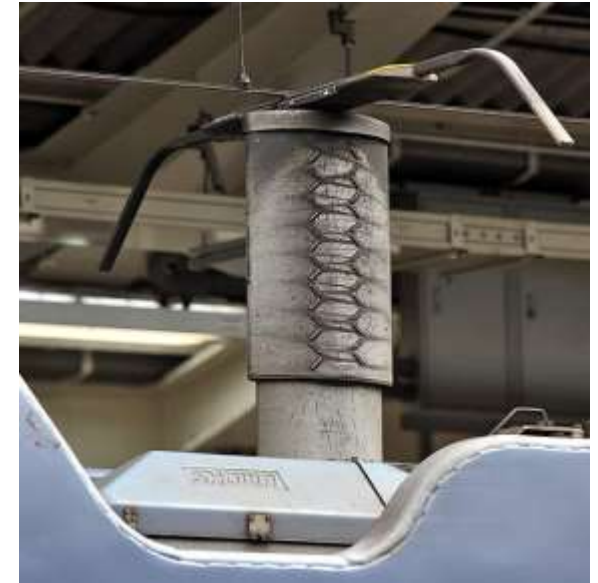
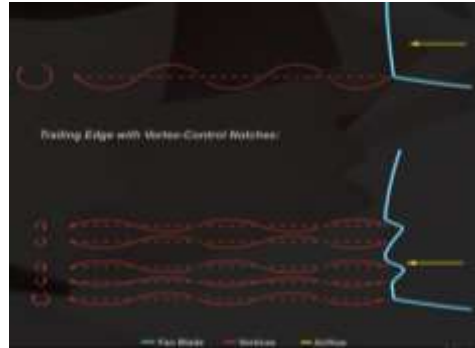


고속열차 공기역학 소음 저감

(Aeroacoustics of High speed trains (Pantograph, Fan, Motor etc.))

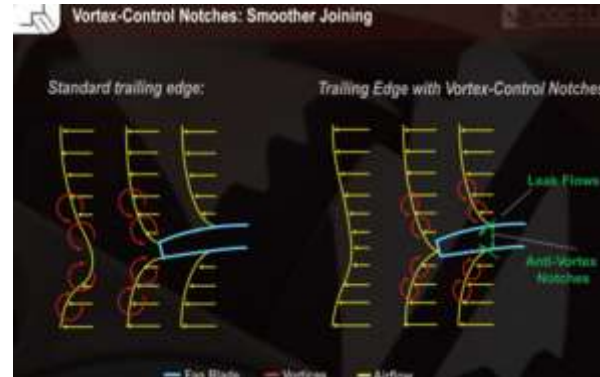
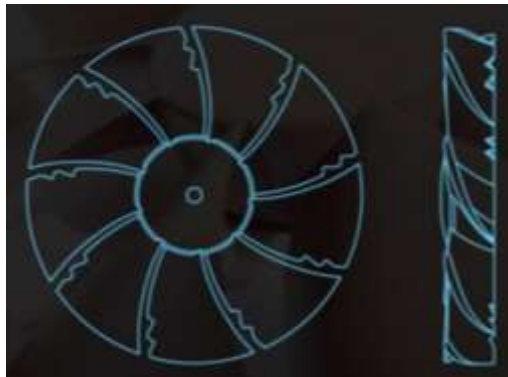
❖ Active control for motion and aerodynamic force on pantograph

- Aerodynamics + Structure + Multibody dynamics + Control



❖ Active or passive noise control for drone and fan

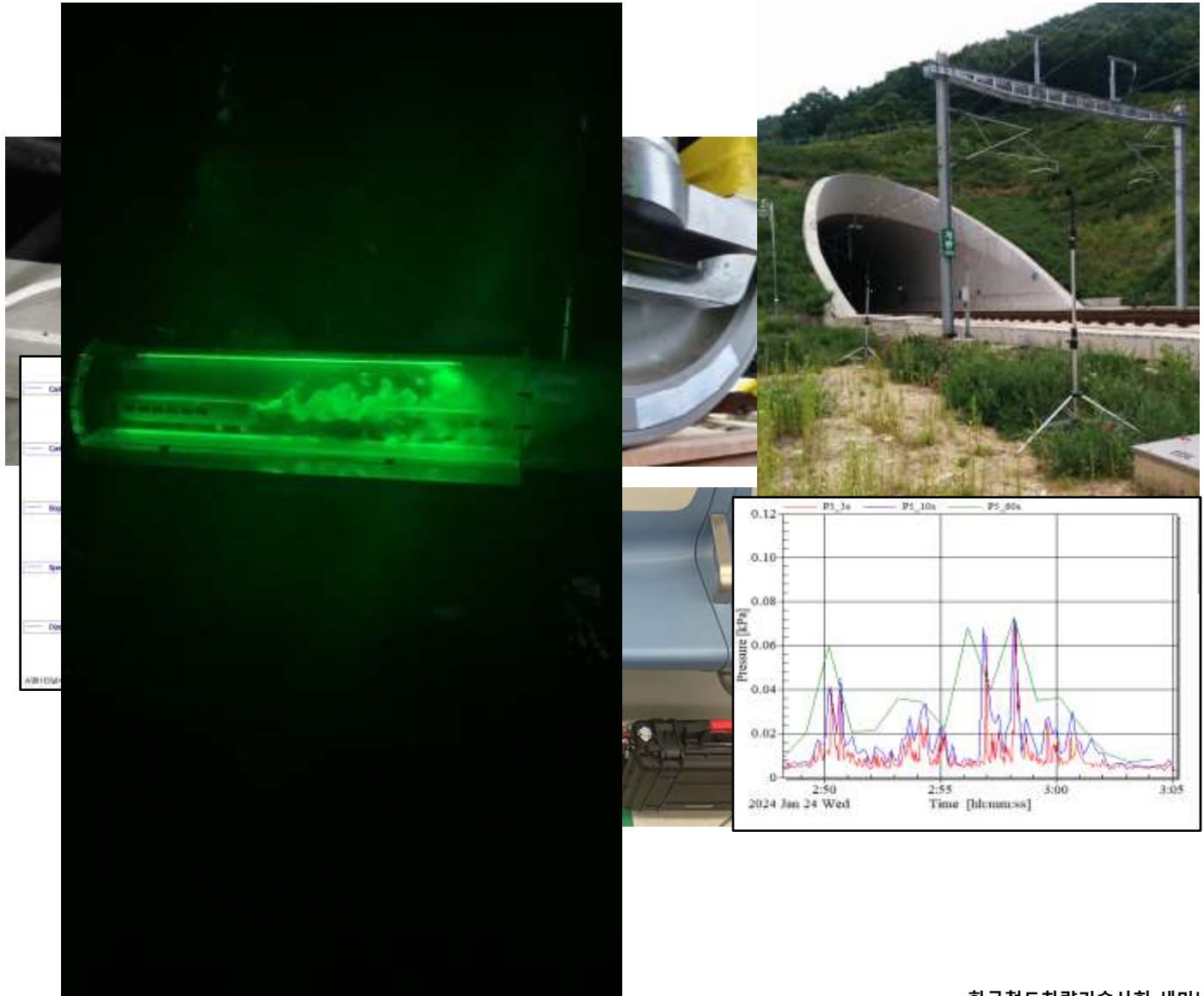
- Aerodynamics + Acoustics + Noise control



철도공기역학과 시설물검증시험

(Facility verification tests with Railroad aerodynamics)

- ❖ TR_03
터널검증시험
- ❖ RO_01
증속 및 선로
최고속도 주행시험
 - 편성열차 거동 관찰
 - 기밀 시험
 - ...
- ❖ 터널 화재 검증 시험



❖ 돌발 퀴즈.

최신 고속열차와 다른 특징을 가진 전두부 형태 하나는?



Hint!

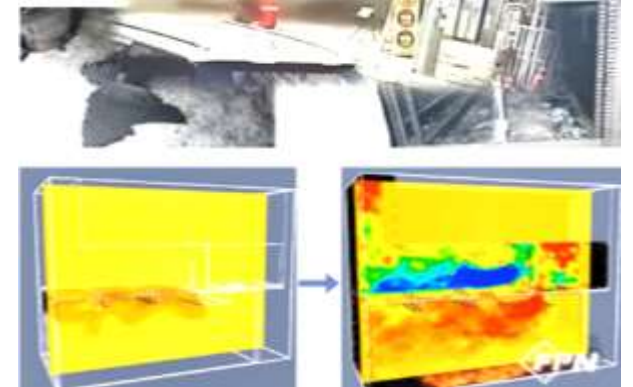
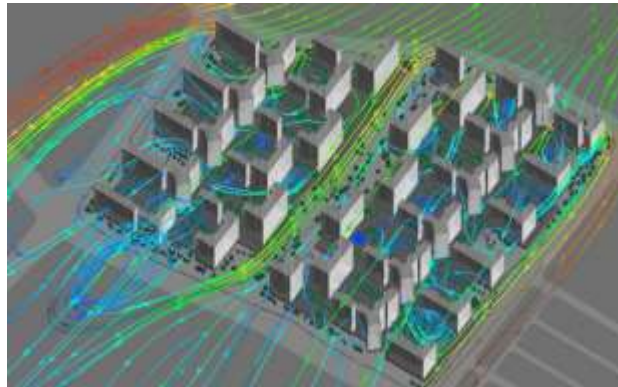


공력 형상의 차이가 인터페이스 문제를 야기할 수 있을까요?



공기역학 설계의 사회적 확산 (Aerodynamic design for Future society)

❖ Aerodynamics + Transportations + Infrastructures + Energy + Safety + AI



High speed trains in “Innotrans 2024”



❖ Thank you.

