FACULTY OF ENGINEERING AND ARCHITECTURE

DEPARTMENT ELECTRICAL ENERGY, METALS, MECHANICAL CONSTRUCTION & SYSTEMS
SUSTAINABLE THERMO-FLUID ENERGY SYSTEMS GROUP

ENGINE SIMULATIONS

Gilles Decan

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PRETREF

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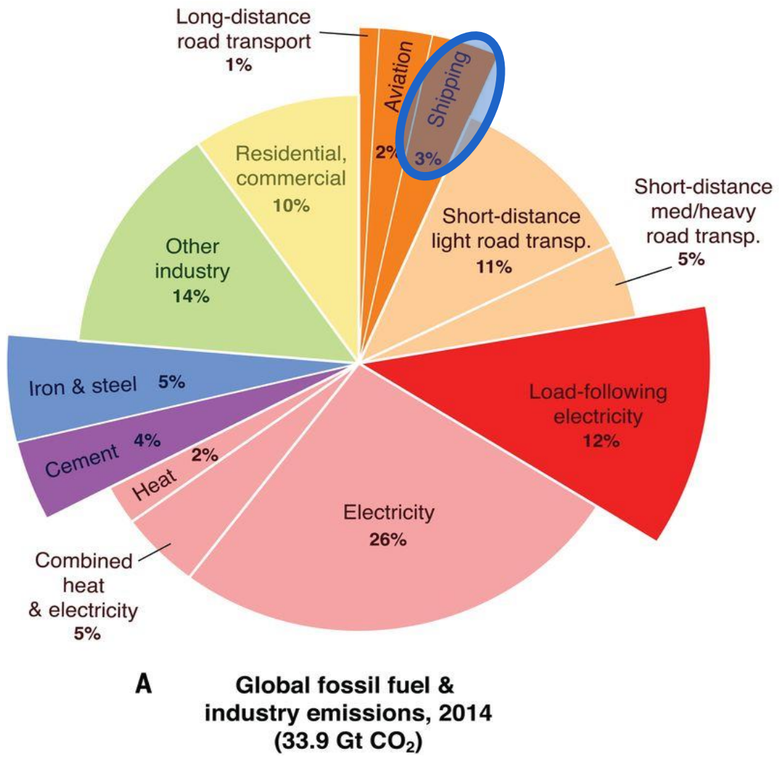
MARINE INDUSTRY

- Global warming impact ships
- Harmful pollutant emissions
- Drive for new **engine** technologies



A **Global fossil fuel & industry emissions, 2014 (33.9 Gt CO_2)**

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FROM DIESEL TO DUAL FUEL

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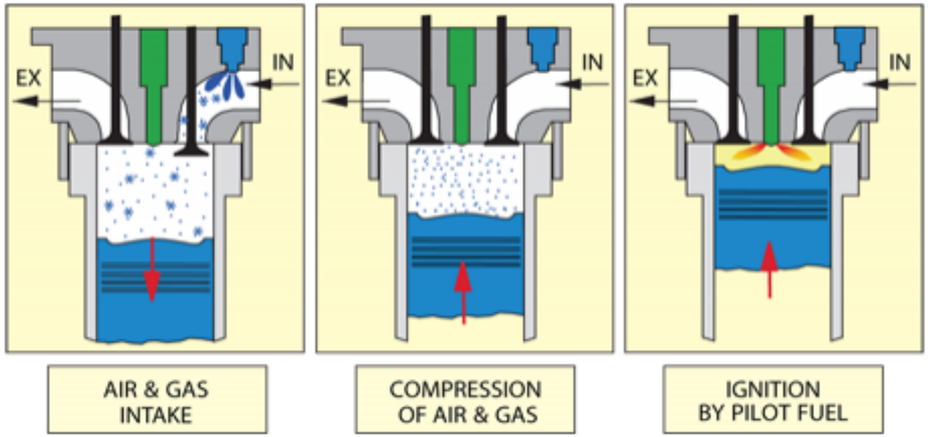
- Replace 90 – 95% of diesel by low-carbon alternative
  - CH_4 / CH_3OH / H_2
  - Reduce emissions and CO_2
  - Retrofit
  - Introduce renewable fuels (bio, e-fuels)



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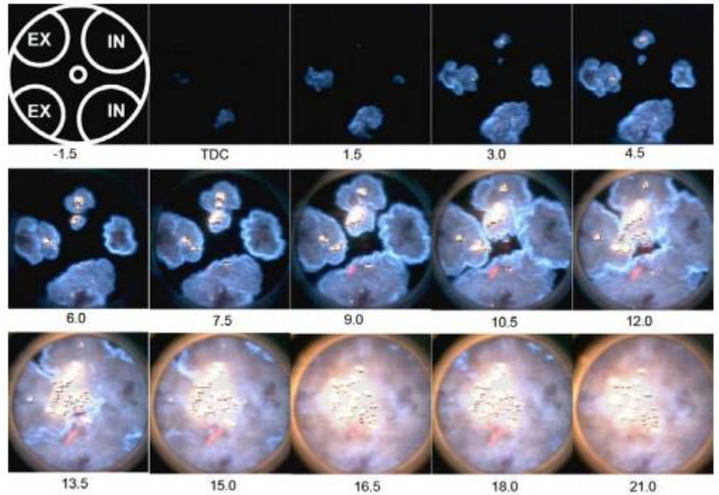
ENGINE DEVELOPMENT

OpenFOAM simulations for engine development

- Modeling of the fumigated dual-fuel operation
  - Mesh motion
  - Diesel pilot injection
  - Diesel auto-ignition
  - Flame propagation



- Engine optimization at limit of operation
  - Low & high load
  - Lean & rich limits
  - Optimized SR
  - Flame extinction and knocking

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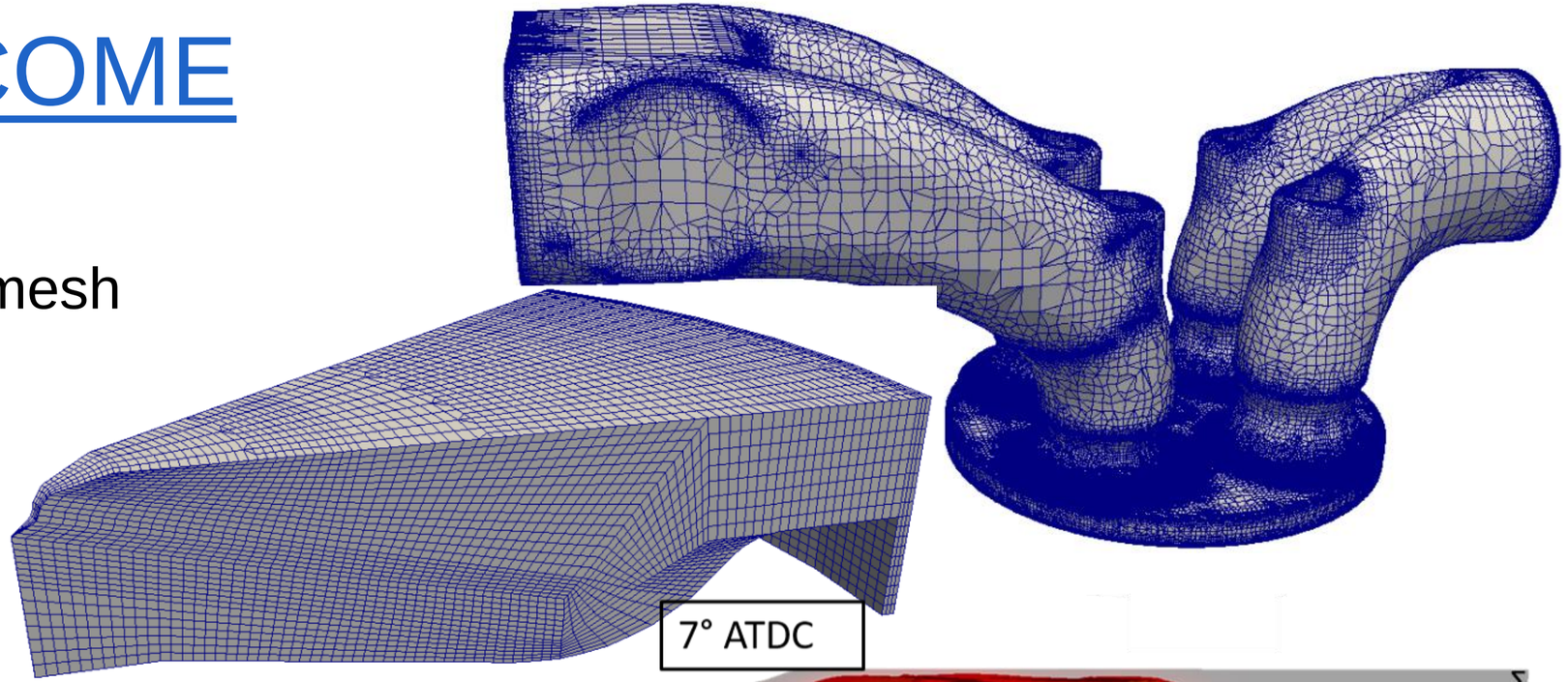
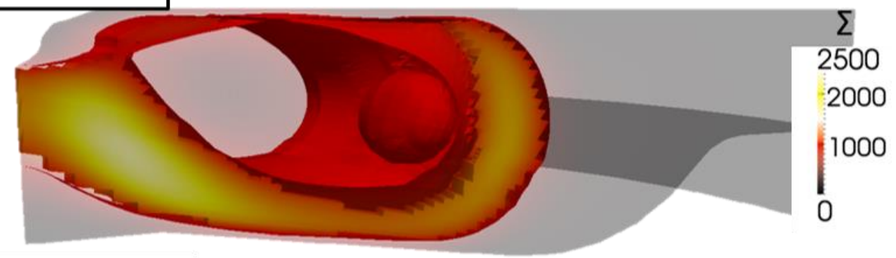
PRETREF OUTCOME

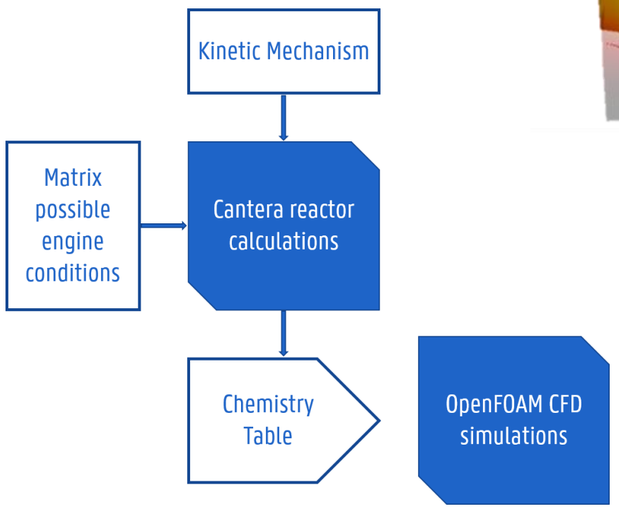
- Engine meshing tools
  - Spray-oriented sector mesh
  - Full engine mesh

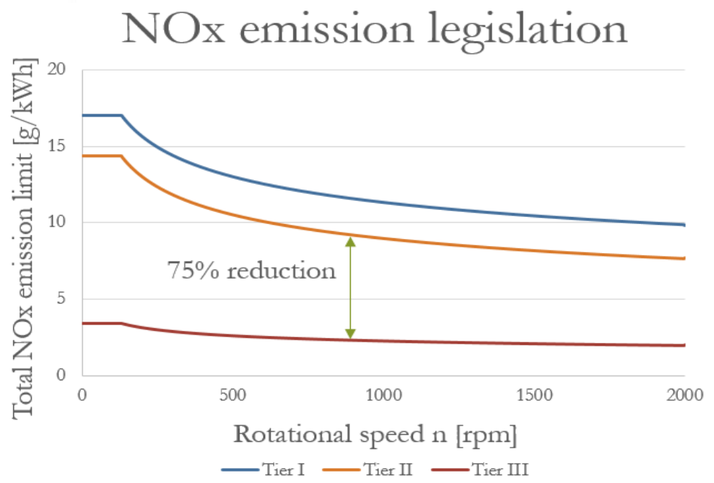


- Diesel pilot spray



- Combustion modeling
  - Tabulated kinetics
  - Flame propagation
  - Emission modeling





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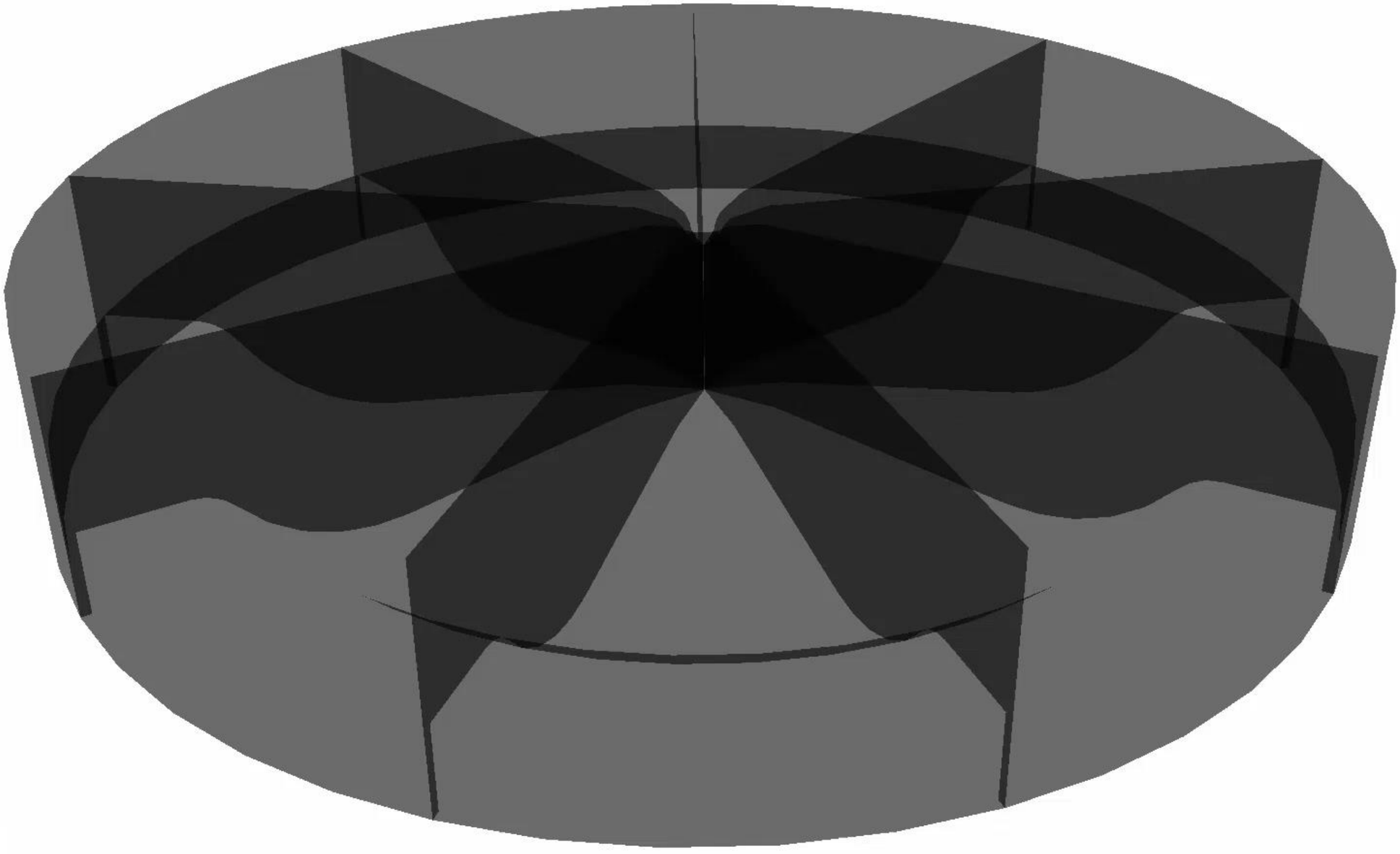

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