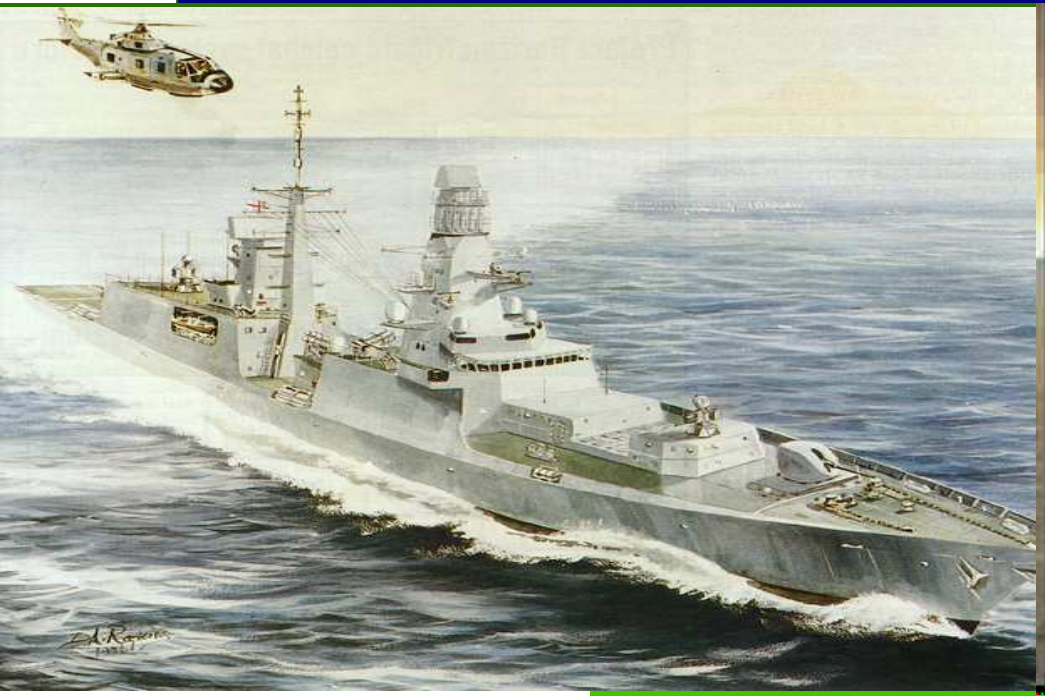
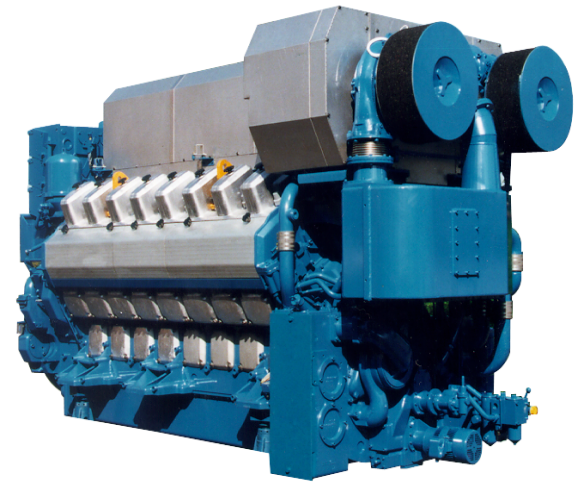
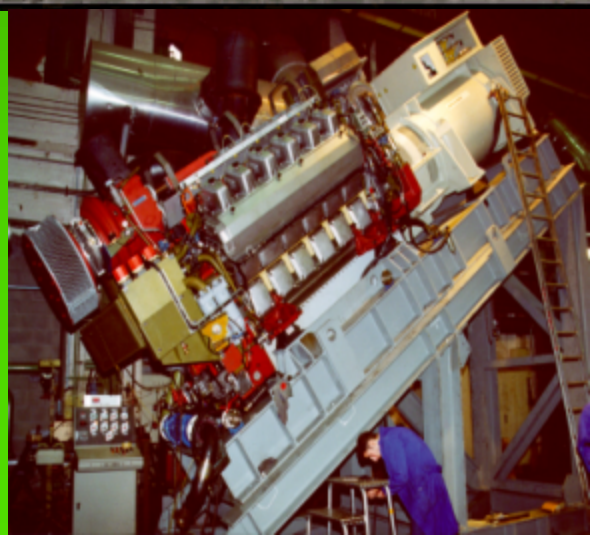
The Future Fleet - Type 45 Project





Main technical data

- Bore 200 mm
- Stroke 240 mm
- Swept volume 7,5 litr./cyl
- Speed 1200 - 1500 rpm
- Weight 13000 - 19000 kg



Potential Future Fleet (CVF, FSC) - Trimaran Frigate

The Electric Ship Programme

DSSC MARINE ENGINEERING

ME Development Strategy Paper

Advanced Cycle Gas Turbines

Integrated Full Electric Propulsion

Widespread Electrification

Diesel Beater?

Investment Appraisal

COTS?

Emissions

- Background
- Policy / Strategy
- Monitor
  - Legislation
  - Technology
- Evaluate
- Development
  - SCR
  - NTP

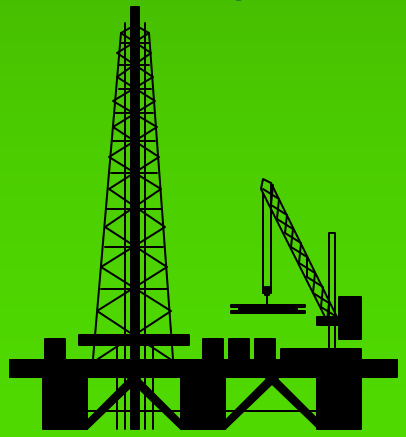
Background

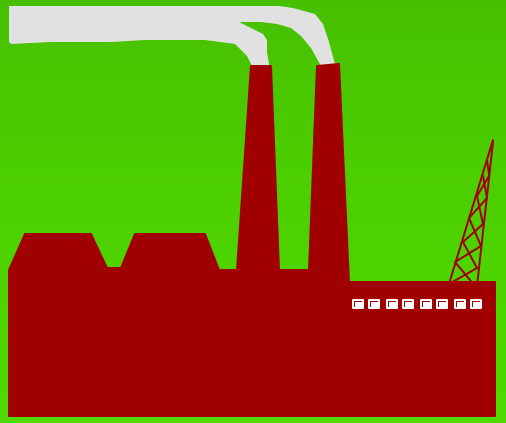
“ We as a species, as a planet,

are teetering on the edge,

living unsustainably and perpetuating inequity,

and may soon pass the point of no return.”





MOD - Policy/Strategy

- the MOD must comply with UK legislation
- the MOD must comply with international conventions to which the UK is a signatory
- the MOD cannot invoke Crown immunity unless operationally necessary
- regulations of host nations must be respected
- the MOD is to take a lead in addressing environmental issues and to enhance the natural environment
- the specific RN policy on engine emissions is derived from general MOD policy

Survey on Measures to Reduce the NO_x Emissions

MEASURES

Engine internal (Primary)

- Modifications of the combustion process
  - Retarded injection
  - Injection rate modelling
  - Miller supercharging
- Exhaust gas treatment in the combustion chamber
  - Fuel-water emulsion
  - Direct water injection
  - Humidification of intake air

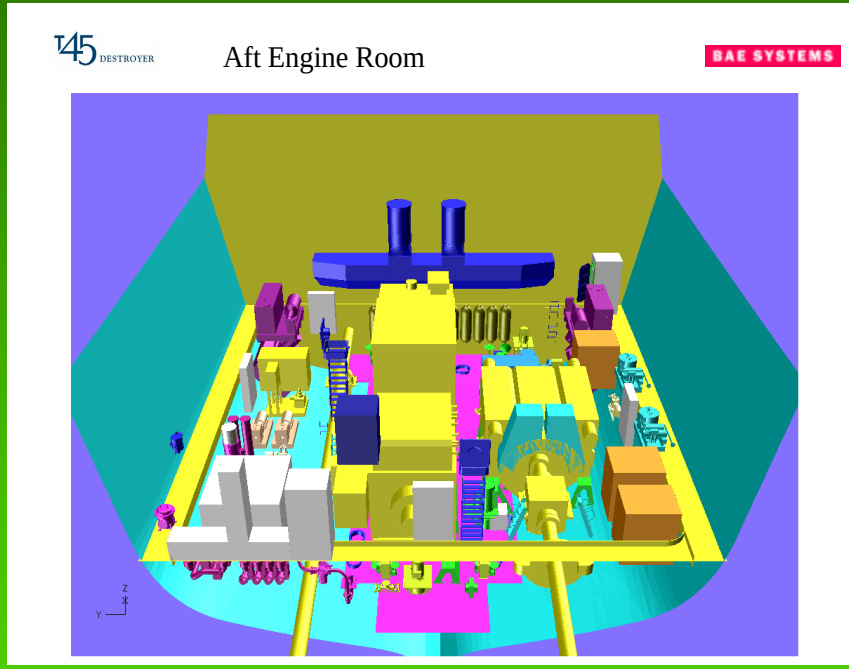
Engine external (Secondary)

- Exhaust gas treatment outside the combustion chamber
  - Catalytic Subsequent Exhaust gas treatment
    SCR
  - Non-Thermal Plasma
    AEA Technology

Environmental Aim - UK MOD(N)

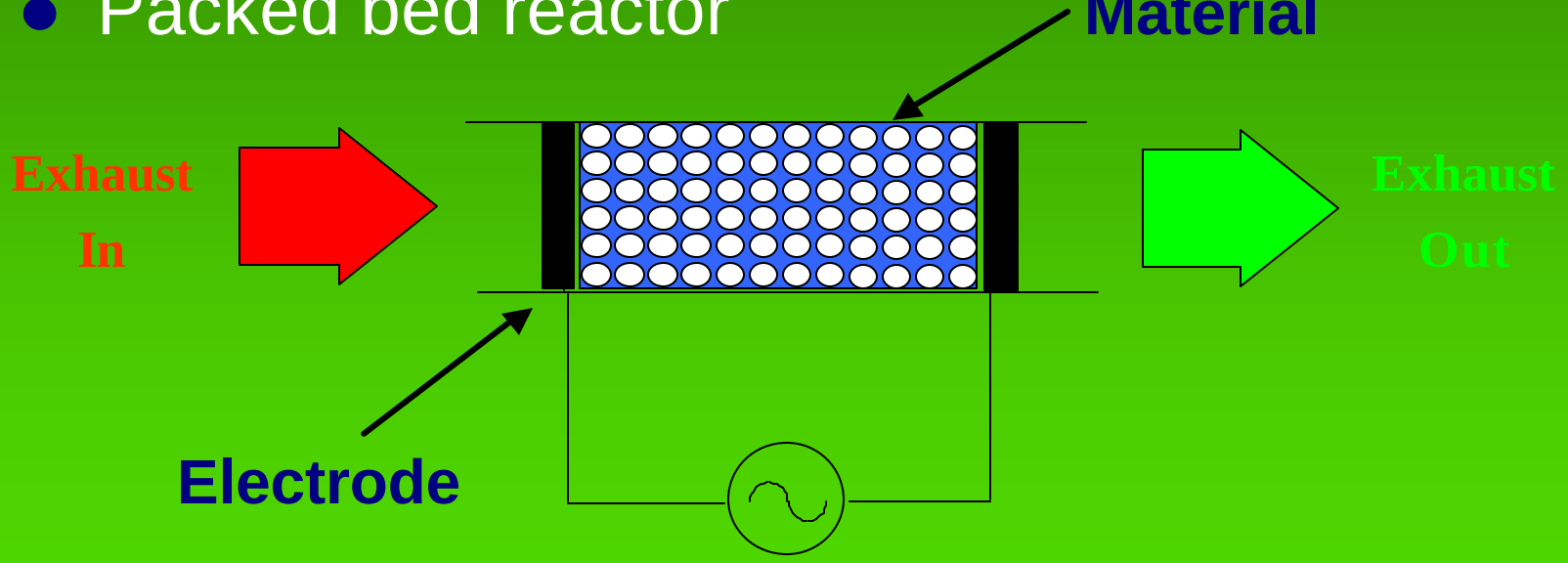
To maintain legislative compliance

- DEVELOPMENT
  - Aftertreatment as good as SCR
  - improved performance
    - low load
    - shock
    - nil reductant requirement
    - fullest range of engine sizes
    - all environments
    - (including submarines)
    - all MGO fuels



NTP - Principle of Operation

- Surface discharge
- Electrically augmented catalyst
- Alternating high voltage
- Packed bed reactor



1/10th scale system design

Combined NOx and particulate removal

- Encapsulating full scale design features
- Ship Integration
  - Type 23 Frigate
  - HUNT, SRMH, LPH, ASTUTE, FASM, FSC, CV(F)
  - ILS / ARM
- Safety Case
  - DEFSTAN 00-56, JSP 430, JSP 375 & JSP 418
- To be tested on indicative engine
  - Paxman Valenta/ VP185