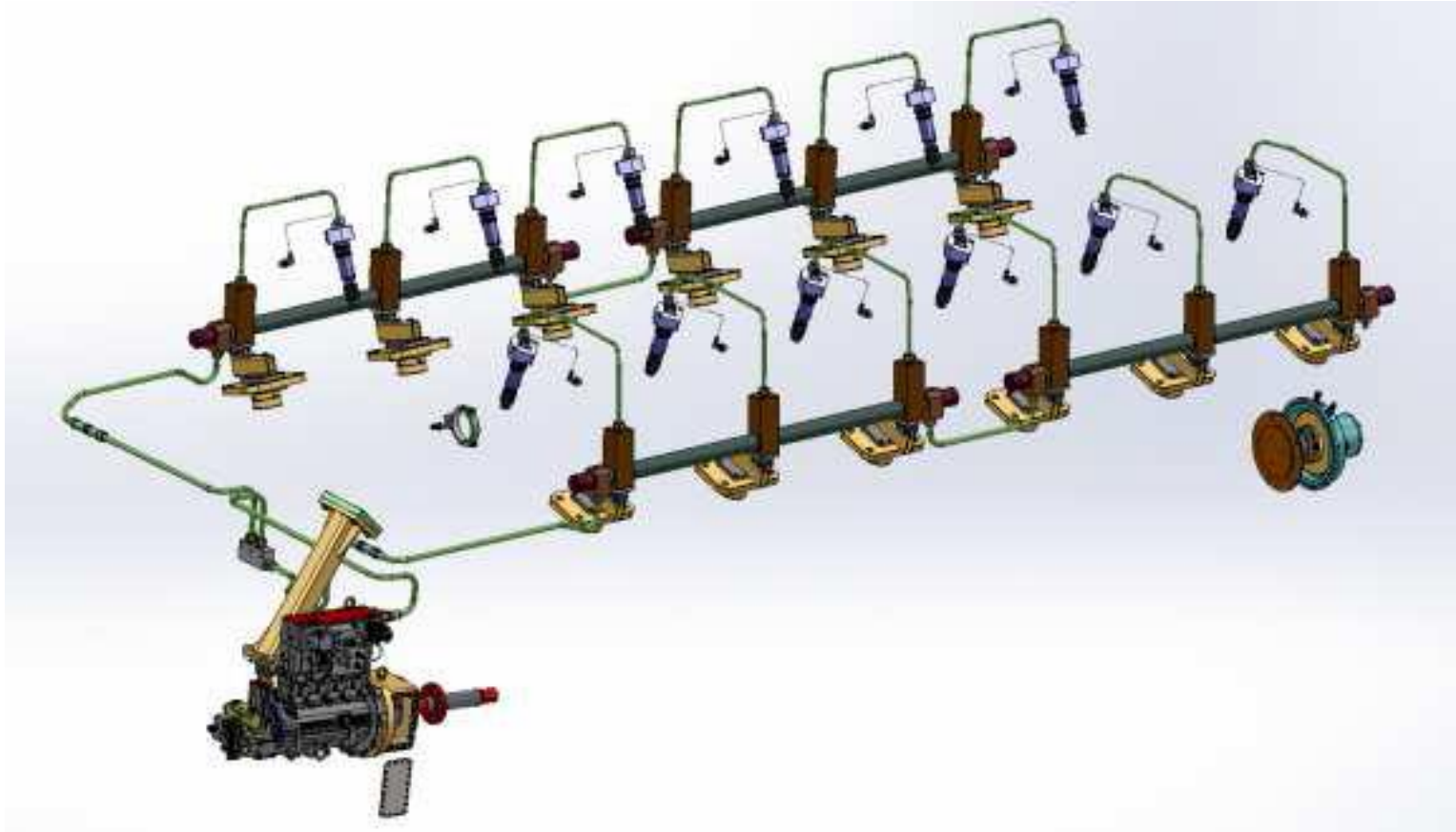


# Improvement of Environmental performance, common rail



# Improvement of Environmental performance, common rail

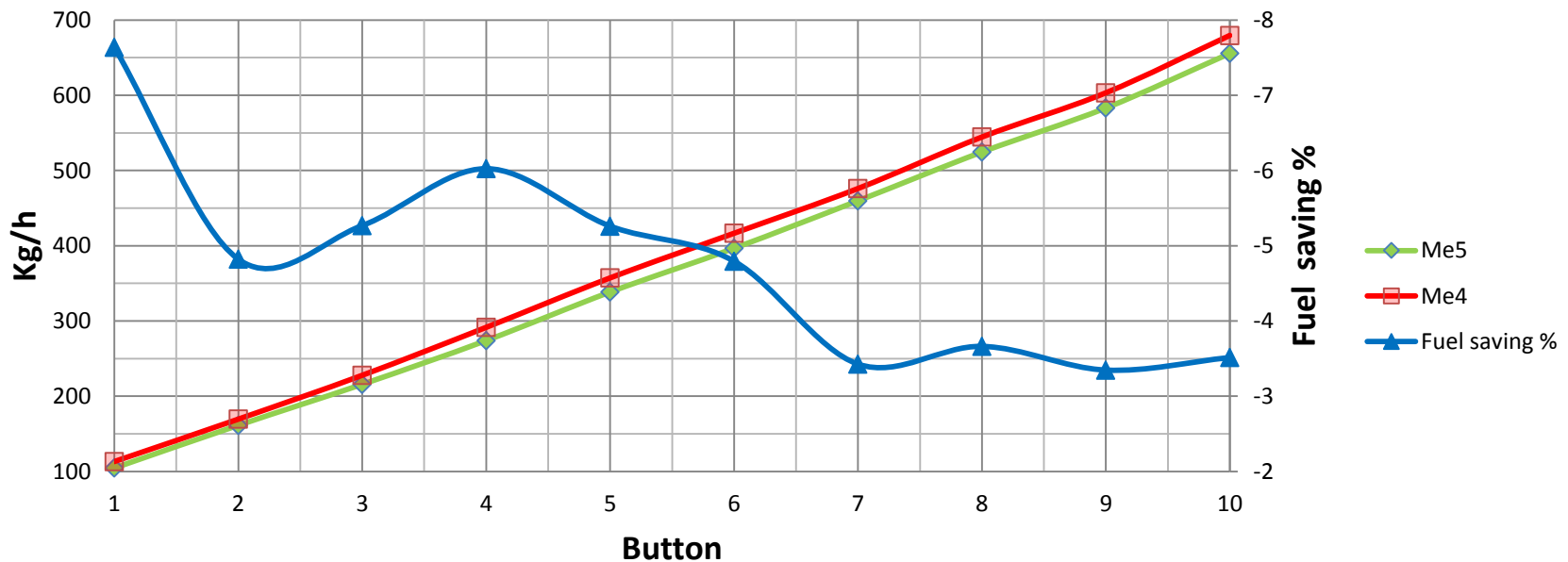
The objective of Activity 3 was to improve energy efficiency and environment performance on existing engines aboard IBs of ATLE-class.

A full scale pilot project, where new fuel injection technique was tested and evaluated, on one of the ice breaker YMERS 5 main engines has been performed.

# Improvement of Environmental performance, common rail

The main target of fuel saving is achieved. Over the seasons 2013-2015 ~2 M values has been analyzed. After the last adjustments it gave a saving of 7.3 %.

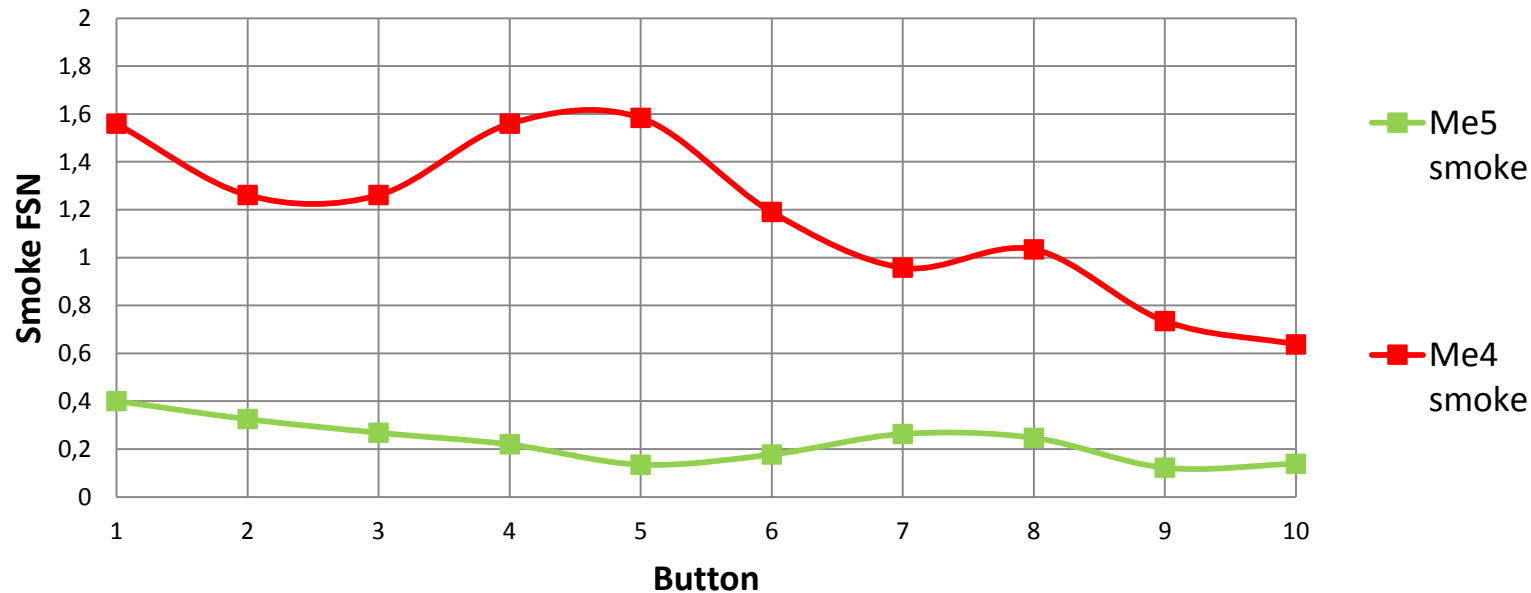
**Fuel consumption in stable load points**



# Improvement of Environmental performance, common rail

The smoke (Black Carbon) disappeared almost completely!  
The FSN value is under 0,5 in all load points.

### Smoke Emission



# Improvement of Environmental performance, common rail

The marks left on pistons show clearly the quality of the spray and combustion.

On ME5, converted to Common Rail, the spray is homogeneous with low carbon deposits. These are indications of a good combustion process



On ME4, reference engine, the inhomogeneities of the spray is very high. deposits are visible



# Improvement of Environmental performance, common rail

The conversion of fuel injection system to Heinzmann Common Rail System allow to:

- Decrease operational costs thanks to a reduced fuel consumption
- Comply emissions regulations
- Decrease maintenance costs thanks to optimized combustion process
- Increase engine lifetime
- Improve crew's working conditions due to lower vibrations and noise levels

# Improvement of Environmental performance, common rail

Also, the conversion of fuel injection system to common rail allow the icebreaker to run with variable diesel engine speed, tests have shown high potential in additional fuel savings.

The same power output is obtained by ME 4 with nominal speed (485 rpm) and by ME 5 with a reduced speed (350 rpm). Measurements are done at 34% load.

	ME 5	ME 4
Button	4	4
Power (kW)	1174	1176
<b>Speed (rpm)</b>	<b>350</b>	<b>485</b>
Fuel consumption (g/kWh)	219,33	246,86