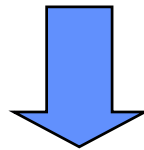


RTA/RT-flex engines in service

DU's response to rising cost of cylinder liner lubricating oil



Application of Retrofit Pulse Lubricating System (RPLS)

November 2006 DIESEL UNITED, LTD.

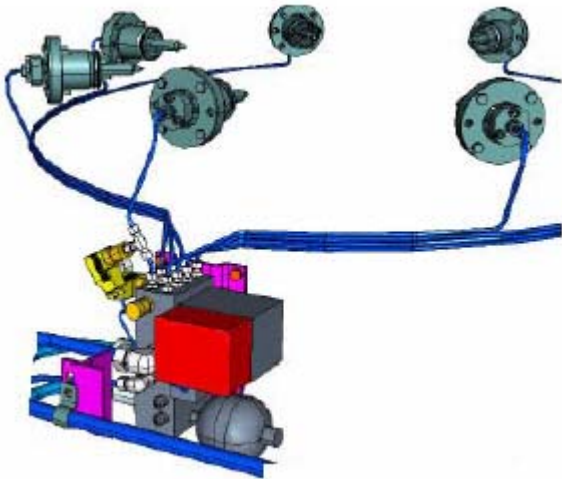
Applicable engine type and time as for retrofitting

- RTA96C from September 2006
- RT-flex96C from September 2006
- RTA84C from Middle of 2007
- RTA84T/TB from Third quarter of 2007
- RT-flex84TD from Third quarter of 2007
- RTA72 from Third quarter of 2007
- Other types Undecided

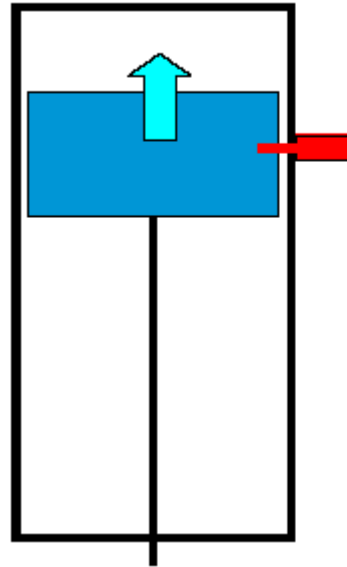
We will individually consult about the delivery date when it undertakes actual application.

Main principles of RPLS

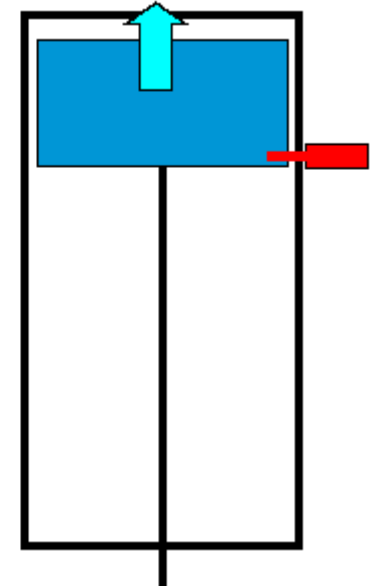
- Based on Wartsila Pulse lubricating technology
- Available as retrofit solution for in service RTA engines
- Allows for on board installation during voyage



Electronically Controlled Timed Lubrication

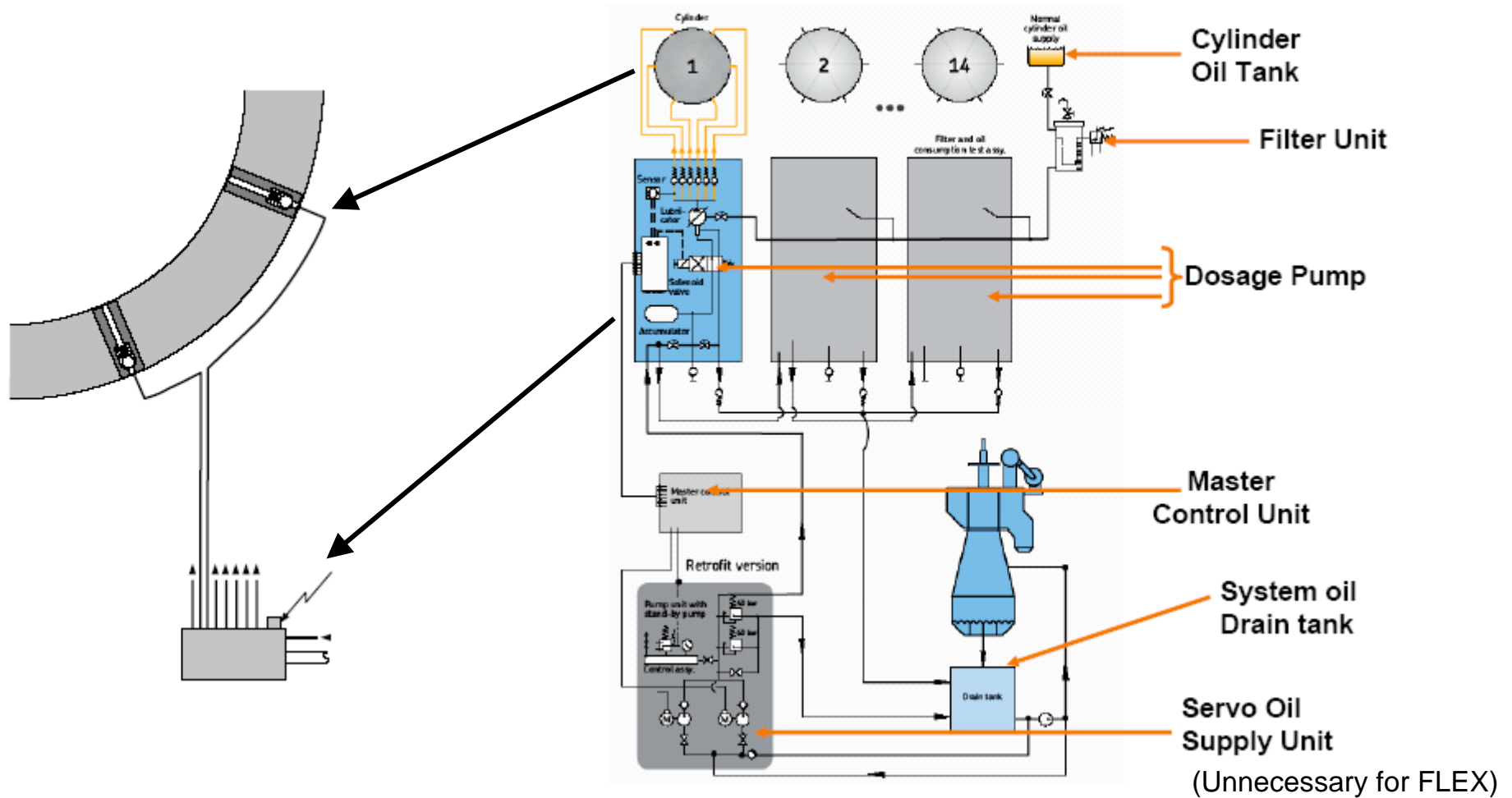


Lube oil distribution into piston ring pack to lubricate piston rings and upper part of liner



Lube oil distribution to piston skirt to lubricate lower part of liner

Basic layout of RPLS



Field test results of RPLS

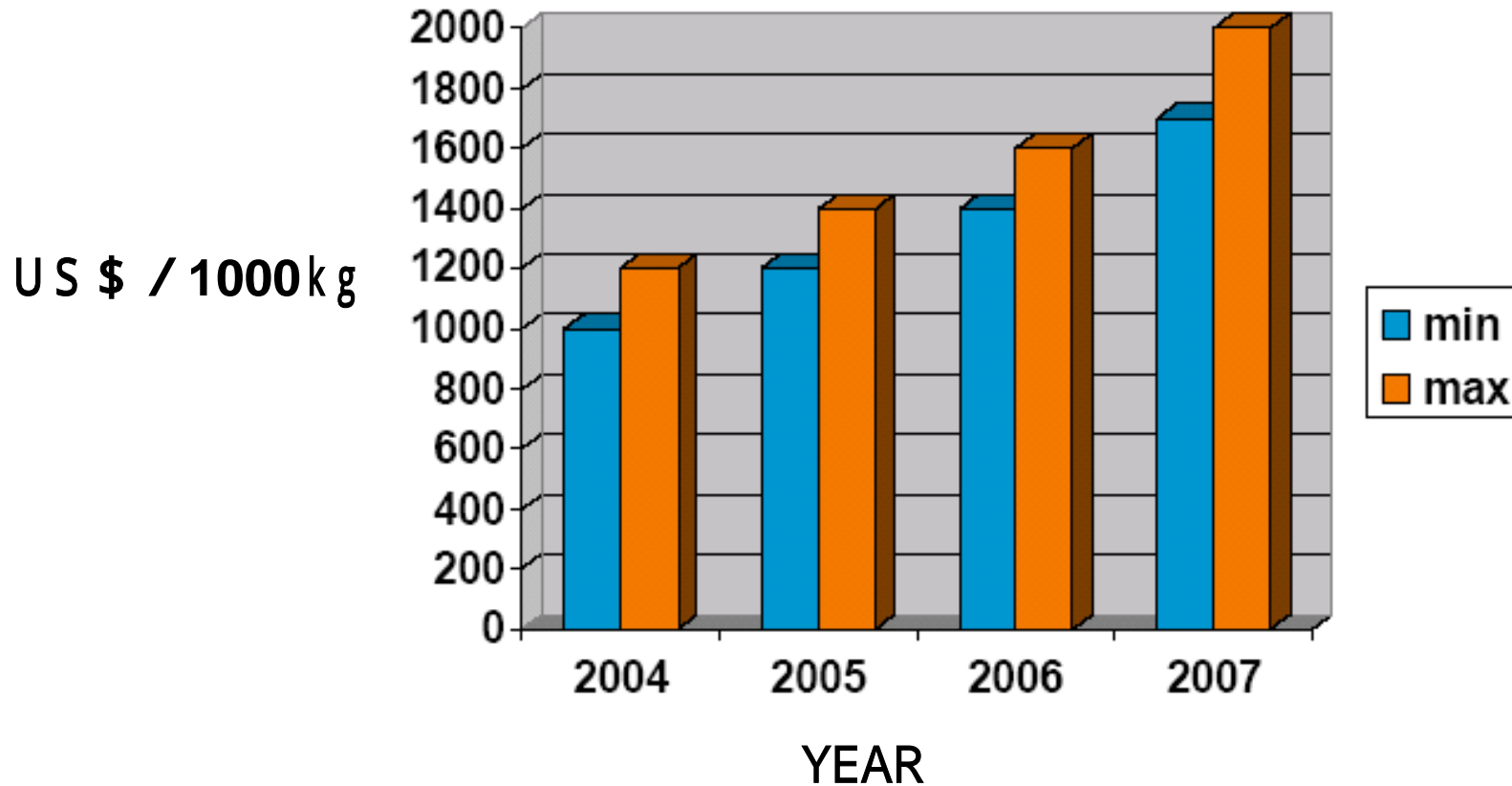
At shop

- **Start on test engine 4RTX-3 in June 2003**
- **Minimum feed rate down to 0.6g/kWh (0.4g/bhph)**

On shipboard

- **Start on field test 6RTA58T in September 2004**
- **Minimum feed rate down to 0.8g/kWh (0.59g/bhph)**
- **Average specific radial liner wear 0.02mm/1000 Hours**
- **Piston rings and liner running surface in good condition**

Rising cost of cylinder liner lubricating oil



Example of estimated annual saving cost

Target engine : 12 RTA96C R1 Rating

CLO feed rate reduction : 0.3 g/kW-h

Running hour /year : 7,000 hours

M/E average load : 65%, 75%, 85%

Horizontal axis : CLO price (per ton)

Vertical axis : Saving cost US \$ / Y

