

SCR Outline Information

ICOMIA and BMF have met or corresponded with selected SCR manufacturers and the information obtained is summarised below for reference.

IMPORTANT: This information provides details on the current 'off-the-shelf' technology which has been applied to large commercial vessels and the strong message from the manufacturers is that this technology is developing at a rapid pace. The products available in 2016 may well bear little resemblance to those available today. The catalyst manufacturers need to understand in more detail the specific restrictions that yacht arrangements cause. There is potentially considerable flexibility in the design of these systems and there may be options to change catalyst shape, size, lengths etc. but there are many variables that influence this design.

Guidance on today's technology employed on commercial vessels:

The catalyst comprises of individual bricks each with approximate dimensions 450mm x 150mm x 150mm (lxbxh). Approximately 20-30 bricks are required per 1000kW, and the guidance varies as to whether one or two levels of bricks are required to achieve the NO_x reduction from IMO Tier II to Tier III. The manufacturers state that these bricks are not sensitive to the sulphur content of fuel used.



The configuration of bricks is relatively flexible but the maximum aspect ratio is 3:1 (see below). The cassettes of bricks fit tightly within a reactor casing comprising 100-150mm mineral wool, external surface lined with 1mm steel. Maintenance access is required to one side of the reactor which would also allow withdrawal of the brick cassettes.

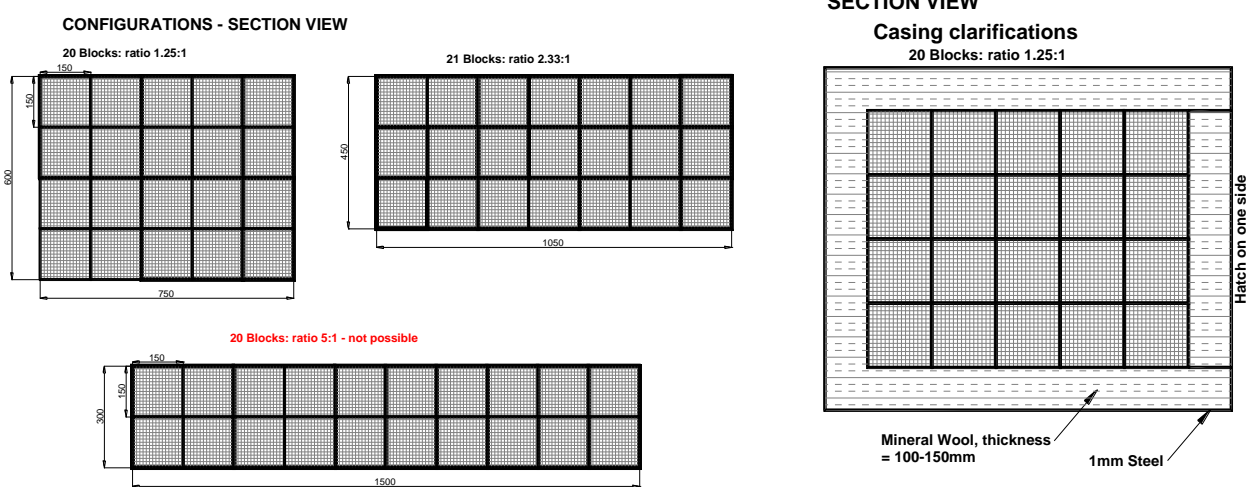


Figure 1. Section views of brick configurations and casing.

Profile View

Note: this has been designed for a large commercial vessel and the installation issues for a yacht are immediately apparent. The installation does not need to be in-line, i.e. there is flexibility in the configuration which can be developed by the SCR manufacturer to be more suitable to a yacht installation.

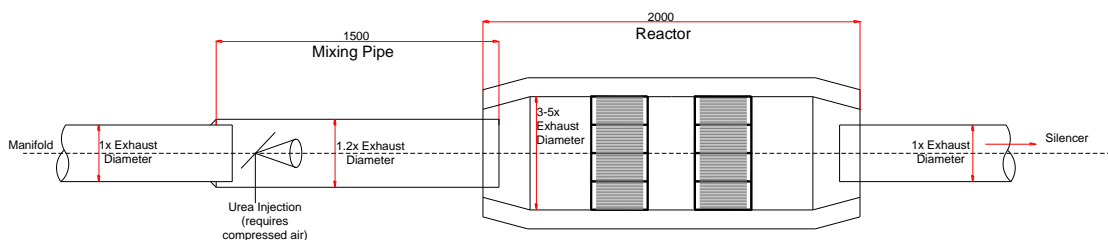


Figure 2. Profile view of a current system.

There are options to improve the installation such as the potential to shorten the mixing pipe, include more levels of catalyst block, one smaller reactor per turbo-charger, include elbows etc. but again these influence other parameters such as back pressure etc.

The extensive work undertaken by MTU and previously presented indicates some aspects of the installation flexibility possible. It should be noted that these initial designs are based on a single level of catalyst bricks.

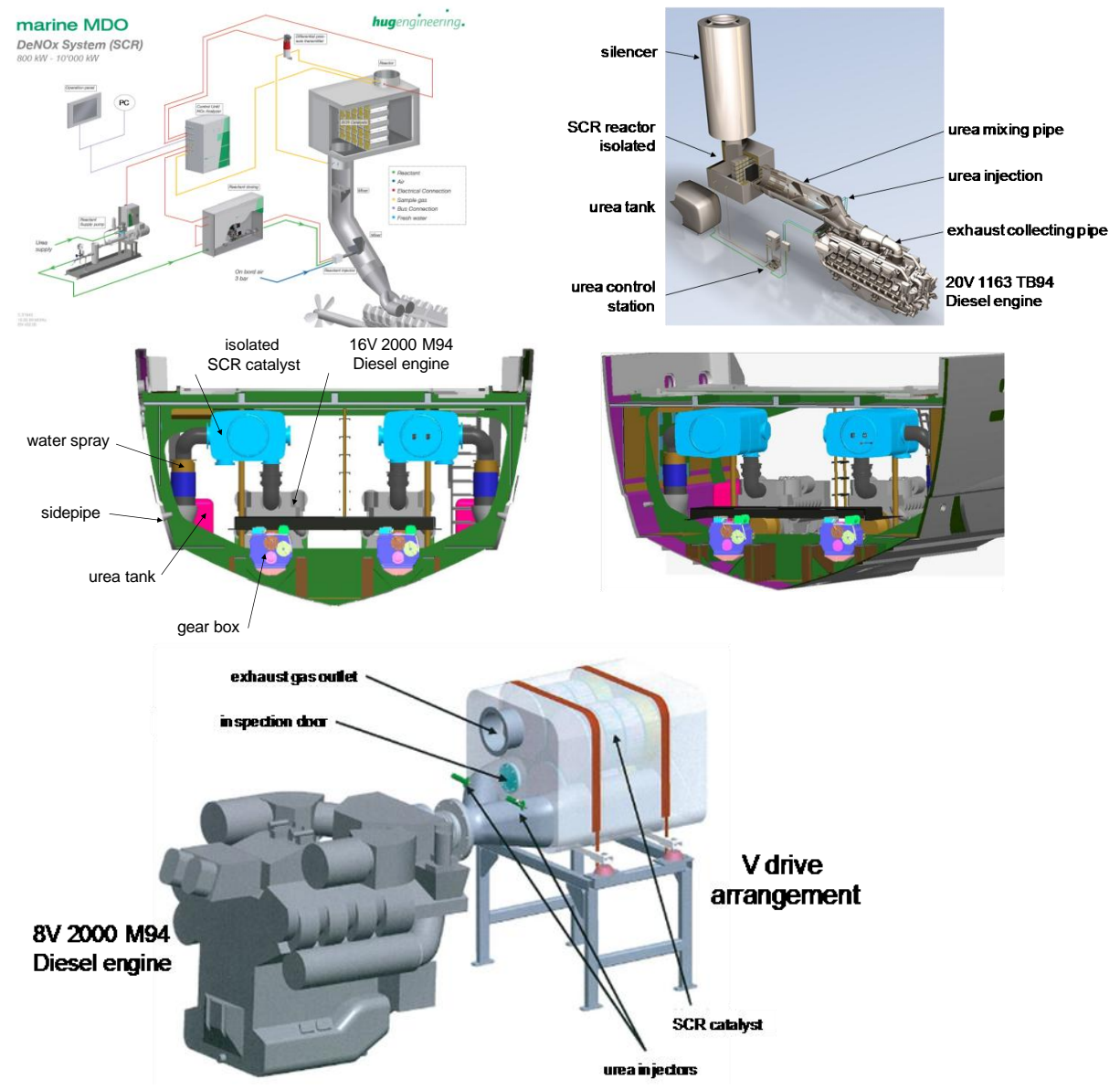


Figure 3. MTU developments

Example Sound Attenuation

The plot below provides a basic indication of sound attenuation for an installation similar to figure 2.

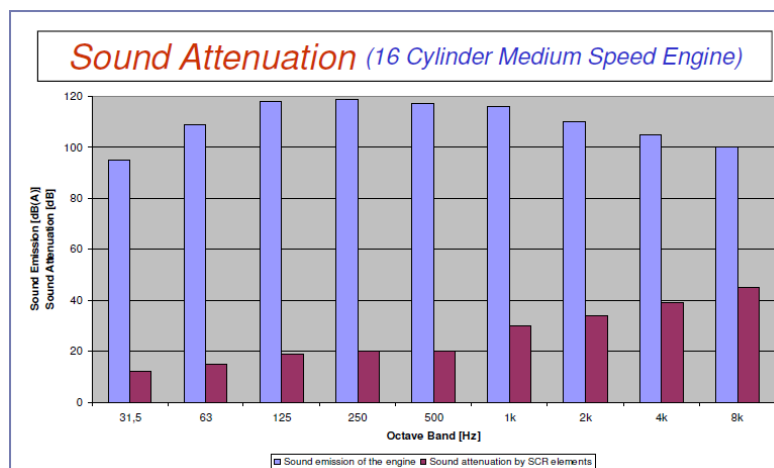


Figure 4. Example sound attenuation.

Further Guidance

Indicative figures for an installation similar to figure 2 are:

- Reactor weight guidance is 600-800kg/MW.
- Back pressure increase 12-15mbar.
- Urea 40% solution - evaporation starts at 55 °C so no cooling required. Consumption at circa 5-7% of fuel consumption. Compressed air required for injection.



Spec Urea Solution
ENG 2010-01-07.pdf

- Invest costs 30 – 50 €/kW; Running costs 5 – 8 €/MWh.

Conclusions

The design of an SCR system is not straightforward and over-simplifying the process to provide generic installation guidance can risk missing key parameters. Factors such as flow rate, NO₂ content, temperature, pressure drop etc. all have a significant impact on the configuration.

Many of the available installations will not suit the requirements of the yacht industry so the SCR developers and manufacturers need to understand the size of the market and the specific issues we face (an articulation of needs). **In order to facilitate the communication of marine specific requirements a brainstorming session is being planned during PSP Southampton Boat Show at 11am on Thursday 22nd September. It is requested that yards/designers attend this session with details and drawings of the constraints within their designs, specifically machinery space layout drawings. If unable to attend then it is requested that machinery space layout drawings are submitted to ICOMIA in confidence.**

ACTION: Yards

The level and direction of Research & Development can then be determined with a view to providing products more suited to a yacht. Engagement in this process is critical to prepare our industry alongside any lobbying action undertaken.

30th August 2011