資料３１－８

MAN Energy Solutions

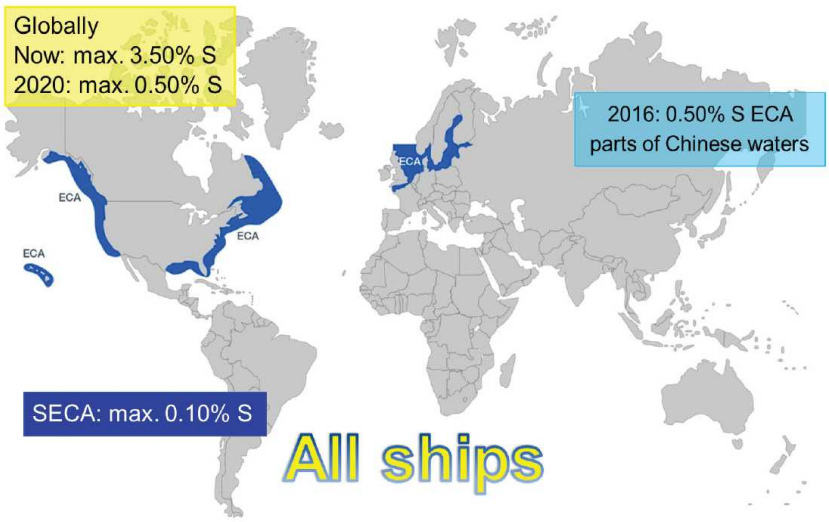
CIMAC Working Group 5

To whom it may concern

Subject: Back-pressure consideration on large 2-stroke engines due to SOx scrubber installation

20th November 2018

On 1 January 2020, the global sulphur (S) limit will be reduced from 3.50% to 0.50%S. This landmark decision, which will have a major impact on the marine industry, was taken in 2016 at the 70th session of IMO's Marine Environment Protection Committee (MEPC 70).
However the further use of High sulphur HFO is allowed provided that an Exhaust Gas Cleaning (EGC) device is installed and certified.



This letter informs about the impact and required action for two-stroke engines which are in service, if a SOx scrubber is to be retrofitted. The Owner / operator needs to know that a comprehensive project approach need to be considered, since a SOx scrubber may require an engine modification, as well as a Technical File amendment in order to comply with IMO NOx Technical Code 2008.

MAN Energy Solutions
Teglholmsgade 41
2450 Copenhagen SV
Denmark
Phone: +45 33 85 11 00
Fax: +45 33 85 10 30
info-cph@man-es.com
www.man-es.com

PrimeServ
Teglholmsgade 41
2450 Copenhagen SV
Denmark
Phone: +45 33 85 11 00
Fax: +45 33 85 10 49
PrimeServ-cph@man-es.com

PRODUCTION
Teglholmsgade 35
2450 Copenhagen SV
Denmark
Phone: +45 33 85 11 00
Fax: +45 33 85 10 17
manufacturing-dk@man-es.com

FORWARDING & RECEIVING
Teglholmsgade 35
2450 Copenhagen SV
Denmark
Phone: +45 33 85 11 00
Fax: +45 33 85 10 16
shipping-cph@man-es.com

MAN Energy Solutions
Branch of MAN Energy Solutions SE, Germany
CVR No.: 31611792
Head office: Teglholmsgade 41
2450 Copenhagen SV, Denmark
German Reg.No.: HRB 22056
Amtsgericht Augsburg
MAN Energy Solutions – a member of the MAN Group

For the sake of clarity MAN Energy Solutions point out that the SOx scrubber layout, installation arrangement, vessel installation interfaces as well SOx emission compliance plan shall be handled by SOx scrubber maker and ship owner.

MAN Energy Solutions however see the obligation to inform about legal (IMO compliance) and technical impacts along a planned SOx scrubber installation and provide the support for owners and operators accordingly.

The ship owner has to decide if the SOx scrubber shall be laid out to 100% MCR (main continuous rating) power or if it shall be laid out for operation up to a limited MCR power, e.g. 70% MCR power.
If the ship owner decides to install an exhaust gas cleaning system (EGC) with part load layout, the EGC cleaning capacity has to be matched for the specified part-load layout. The engine must always be able to run at 100% MCR, hence the EGC layout (exhaust gas path) must be designed for 100% MCR gas flow, unless an exhaust-gas path bypass is installed.

In the following the technical background for both, the standard engine set-up, as well as for the matched engine set-up, handling an increase back-pressure due to a SOx scrubber, is illustrated:

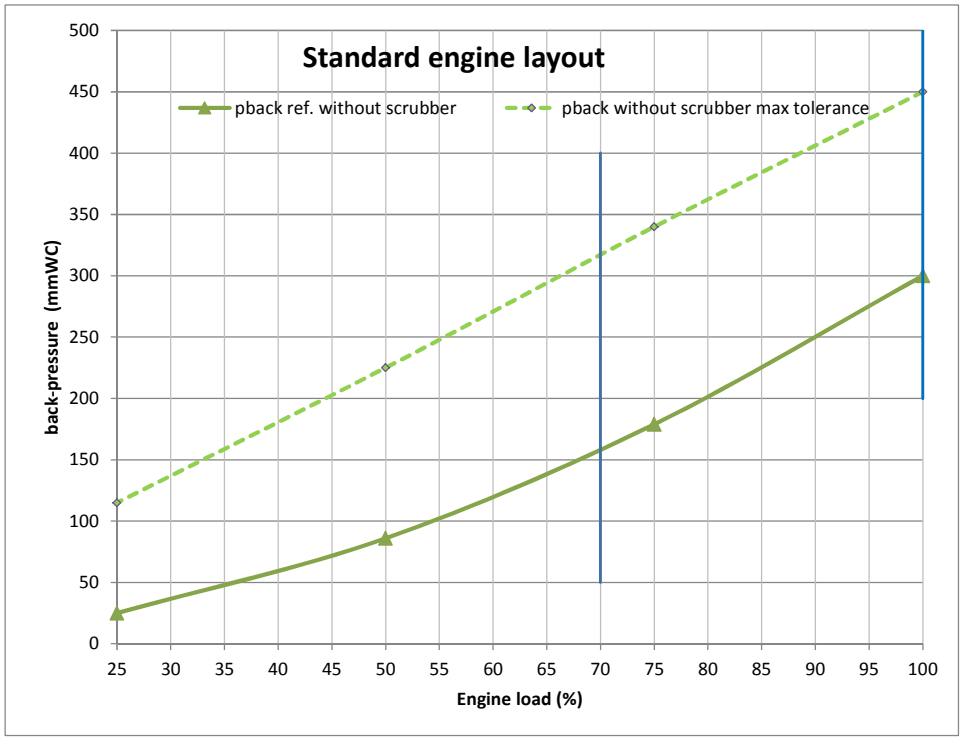


Figure 1: Standard engine back pressure layout

Two stroke engines in service have been specified/ built for many decades for a.m. standard back set-up (reference p back at 100%MCR of 300 mm WC), which was also the baseline for Technical File approval by class societies.
This certification is based on the boundary condition that the back pressure at max. tolerance at any given engine load (see dotted line in figure 2) is not exceeded.

Some years ago a further engine set-up for an increased back pressure (reference p back at 100%MCR of 600 mm WC) was introduced. This set-up was selected on new-building in preparation for SOx scrubber installation.
Thus Technical File approval was based on the back pressure at max. tolerance at any given engine load (see dotted line in figure 2).

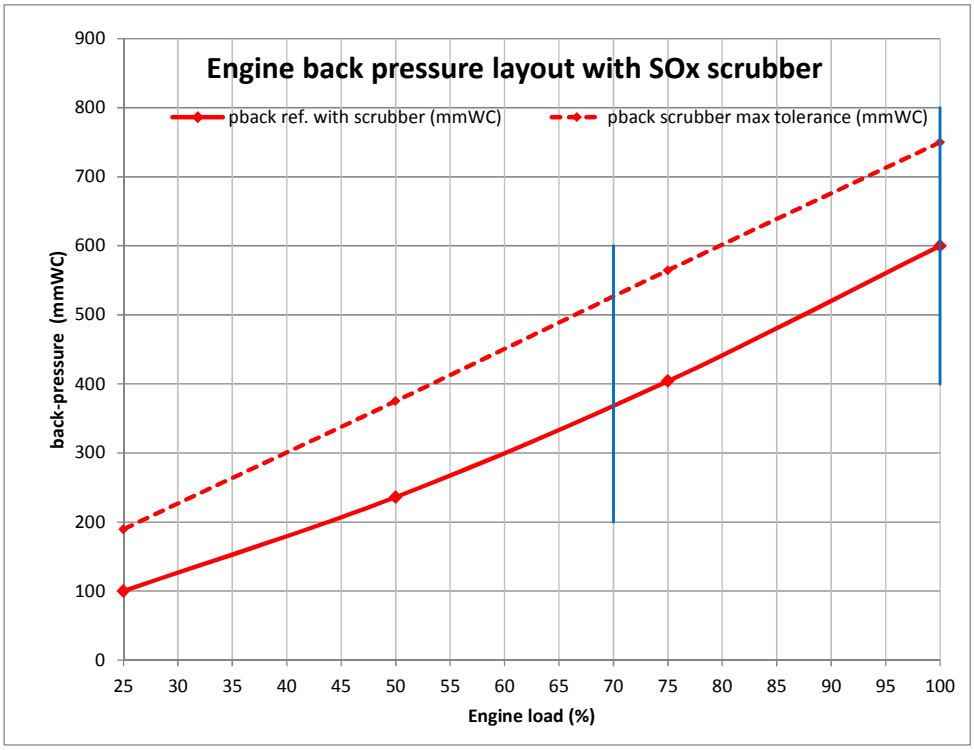


Figure 2: Engine back pressure layout tuned for SOx scrubber installation

For engines in service subject to a SOx scrubber retrofitting it is therefore required to check the max. back pressure situation.

Case A:
If at any engine load the max. back pressure exceeds the max. tolerance value, a TC re-matching for compensation of increased back pressure, thus reduced scavenging pressure is mandatory. Subsequently an amendment of the Technical File with a class society approval process is required.

Case B:
If at any engine load the maximum back pressure is confirmed to be between reference p back curve and p back at max. tolerance the Technical File will remain in compliance with IMO.
In most cases it will however be of advantages / recommended to evaluate a TC re-matching also in order to avoid addition heat-load stress and/or specific fuel-oil consumption penalties. Support for such evaluation can be provided on individual request by the ship owner.

Copenhagen, November 2018

Michael Witt

MAN Energy Solutions
Research & Development, Two-Stroke Business
Teglholmsgade 41
2450 Copenhagen SV
Denmark
Mike.Witt@man-es.com