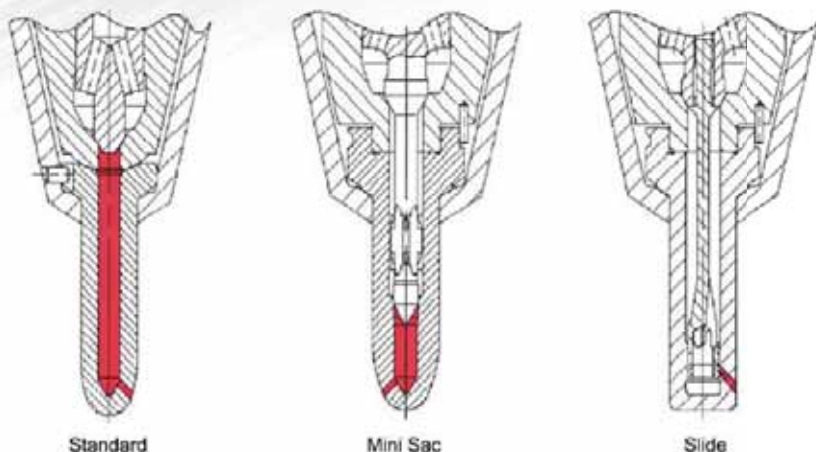


From the front lines

Slide Valves: Small Things That Mean a Lot



Cross sections of fuel-valve nozzle tips.

The fuel injector slide valve has been hailed by industry and regulators as a nice bit of green engineering for the advances it brought in NOx reduction. It is a key component in the retrofit kit that makes 20-year-old engines fit for IMO Tier I emissions compliance. Interestingly, the slide valve was not invented to reduce NOx, but to improve engine efficiency and cylinder condition.

Introduced by MAN B&W in 2002 for its MC series slow-speed marine diesel engines, the slide valve improved on earlier nozzle designs by eliminating a minute channel – called the sac volume – that ran from the injection valve seat to the fuel inlet hole in the combustion chamber. The channel retained a small amount of oil after injection, which would drip into the chamber and burn incompletely. With big ships consuming more than 200 tons of fuel oil per day, those tiny drops added up to quite a lot of wasted fuel. In the slide valve arrangement, the valve sits on the injection holes, reducing sac volume to almost zero and improving fuel efficiency. It also cuts the amount of unburned hydrocarbons, and particulate emissions.

As with the earlier design, slide valves could be adjusted to favor fuel efficiency or NOx reduction. In the six years since they were released, the latter attribute has become the object of much investigation.

“Using computational fluid dynamics, we modeled the effect of changing the number of holes, the spray angles and spray patterns,” says Kjeld Aabo, Director of Promotion and Customer Support for MAN B&W. “This reduces the concentration of fuel oil at the injection point, resulting in smaller peak temperatures in the combustion chamber. Changing combustion conditions changes NOx emissions,” he explains. “The benefit is not related to the slide valve as such, but to the spray pattern. We then were able to develop a kit that could bring our older in-service engines up to Tier I standards.”

“Better fuel efficiency, more complete combustion, less smoke and soot and fewer engine deposits – for these reasons we immediately deployed slide valves in all engines, where it was possible to do so,” says Lars-Robert Pedersen, Director of Regulatory Affairs for AP Moller-Maersk. “From our perspective, all shipowners should apply slide valves immediately, where possible, because it makes perfectly good operational sense. The NOx benefit is a free extra.”



Fuel injector shown with slide valves.