



# BUNKERING

THE OFFICIAL MAGAZINE OF IBIA

## NET ZERO FRAMEWORK DEFERRED IMO KICKS THE CAN DOWN THE ROAD



**INSIDE THIS ISSUE:**

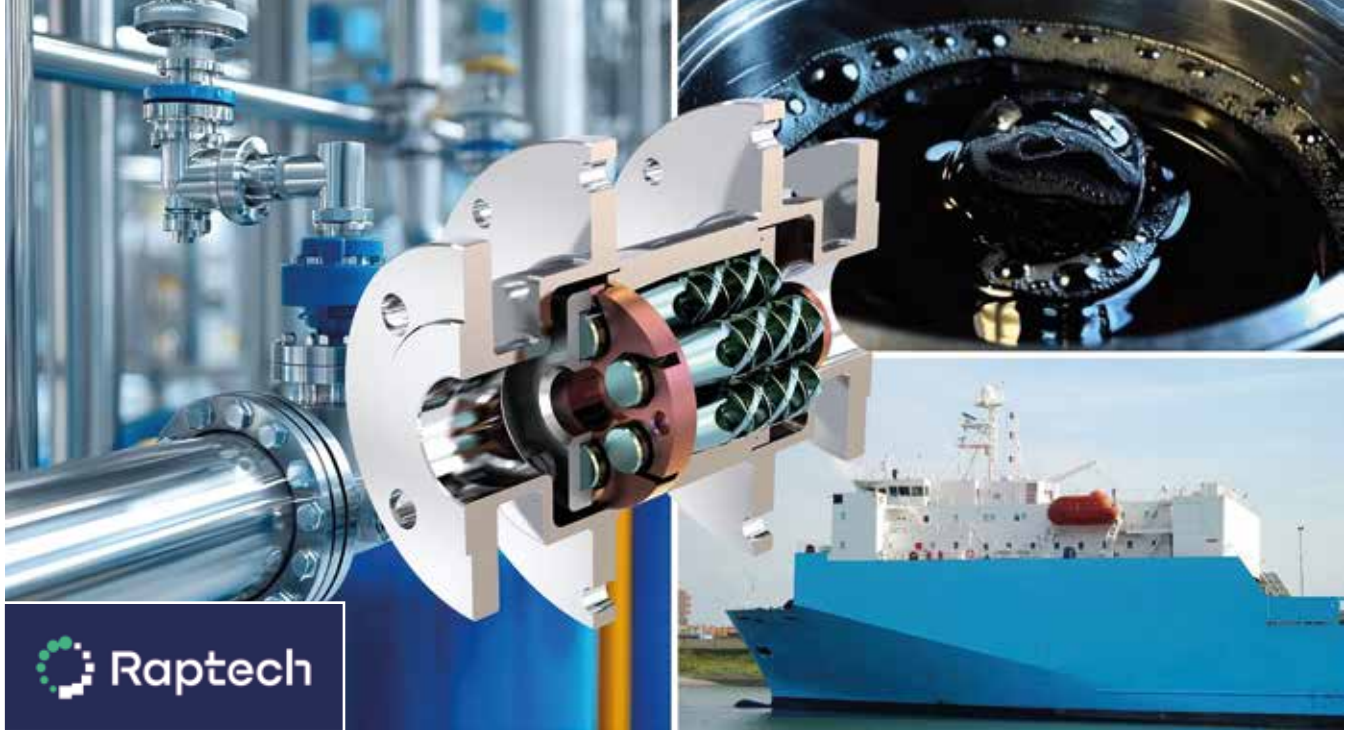


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# CAVITATION TECHNOLOGY FOR A SUSTAINABLE FUEL FUTURE

*Reduce emissions – maintain systems. RAPTECH's CaviFlow® inline-units support the blending of cleaner, homogenized fuels with lower costs plus a gain up in efficiency.*

The marine bunkering industry faces stricter environmental rules, fuel diversification, and cost pressures. RAPTECH's innovative cavitation technology addresses these challenges by combining intense mixing with chemical reactivity, enabling stable emulsions, effective blending, desulfurization, and emission reduction.

RAPTECH has developed with **CaviFlow®** modular cavitation units that can be integrated (plug and play) into **shore-based bunkering terminals, refineries, or onboard units** – without high investment costs. The compact design and adjustable operating conditions allow flexible treatment of different marine fuels, aligning with both regulatory and economic requirements.

## Cleaner, smarter bunkering with RAPTECH

IBIA is advancing guidelines and initiatives that accelerate the uptake of alternative fuels such as methanol, ethanol, biodiesel, and other renewable options. This alignment between technological enablers and industry frameworks highlights the need for solutions that ensure stability, compatibility, and efficiency across a broad spectrum of marine fuels.

Against this backdrop, RAPTECH's patented approach not only supports cleaner, homogenized fuels and lower costs, but also contributes to the industry's transition toward sustainable and IBIA-oriented fuel strategies for shipping.

## Challenges in the Bunkering Sector

Bunkering is in rapid transition. Since the IMO's 2020 sulfur cap, new rules such as **ISO 8217:2024**, carbon intensity indicators (CII/EEXI), and safety guidelines for alternative fuels have reshaped the sector. IBIA has influenced updates like expanded biofuel blend allowances. Operators now face three key challenges:

- **Fuel diversification:** Handling VLSFO, MGO, biofuels, pyrolysis oils, and synthetics in one chain
- **Stability risks:** Avoiding incompatibility, stratification, and storage issues
- **Compliance pressures:** Meeting SOx, NOx, and carbon limits while controlling costs.

These shifts make bunkering both a logistical and technical task. Cavitation provides a solution by stabilizing blends, supporting desulfurization, and enhancing combustion performance.

A gain of up to 4% in fuel efficiency has been observed in heavy fuel oil engine tests, corresponding to potential savings of about € 150–200 per ton of bunker fuel.

## Homogenization and stable emulsions

Cavitation is the controlled formation and collapse of microbubbles in liquids. Implosion releases localized heat, shear, and intense mixing. RAPTECH's **CaviFlow®** modular cavitation units are based on these effects, enabling:

- Homogenization of multi-component fuels
- Enhanced chemical reactions (oxidation, desulfurization, stabilization)
- Formation of fine, stable emulsions

## Applications in Bunkering Fuel Blending and Stability

The shift toward mixed fuels has raised concerns about compatibility and stability during storage. Cavitation ensures **uniform dispersion of asphaltenes and heavy fractions**, including sludge, thereby preventing phase separation. It also enables blending of conventional fuels with biofuels or pyrolysis oils, producing stable mixtures with improved combustion quality.



### Fuel Desulfurization and Upgrading

Cavitation-assisted oxidation processes can facilitate the **desulfurization of heavy fuels**, reducing sulfur content before bunkering. This contributes to compliance with IMO sulfur limits and reduces the need for expensive post-combustion cleaning systems.

### Catalyst Activation and Process Efficiency

In fuel treatment plants, cavitation can act as a **catalyst activation method** by dispersing and energizing catalytic particles. This shortens residence times and increases throughput, offering advantages for large-scale bunkering hubs.

### Reduce emissions – maintain systems

Cavitation technology provides the bunkering industry with a versatile and powerful tool to address its most pressing challenges: **fuel diversity, regulatory compliance, cost control, and environmental sustainability.**

RAPTECH's innovative **CaviFlow®** units show that cavitation is not only a mixing enhancer but a full-fledged reactor, capable of delivering **cleaner fuels, better stability, and improved combustion performance.**

As the shipping industry transitions toward low-carbon and alternative fuels, cavitation stands out as a bridge technology, supporting both current heavy fuels and tomorrow's sustainable, IBIA-aligned marine energy solutions.

We look forward to your requirements.

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*(Images Credit: Collage with Adobe Stocks)*



## Reduce emissions – maintain systems

CaviFlow® inline-units offer an uncomplicated plug & play solution to benefit from cavitation technology for dispersing and homogenizing fuels.

### Advantages:

- individually scalable from 6 m<sup>3</sup>/h to 100 m<sup>3</sup>/h
- quick integration into existing process systems
- without high investment costs
- threaded or flanged connections
- immediately ready for use
- space-saving compared to conventional agitators
- made of (stainless) steel
- no moving parts inside – durable and low maintenance



REDUCE EMISSIONS – MAINTAIN SYSTEMS

# **BLENDING BUNKER FUEL EMULSIONS**

WITH CAVITATION TECHNOLOGY

