

Marine Fuel Sulfur Management

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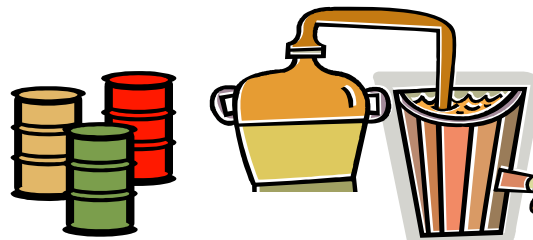
Intelligent Energy's Fuel Sulfur Management Systems

Concept - Membrane Filtration

Produce a low sulfur fuel slip-stream from a bulk supply for use in main and auxiliary engines while in SECA and regulated ports-
System can be dockside or onboard



Ship fuels up with available fuel



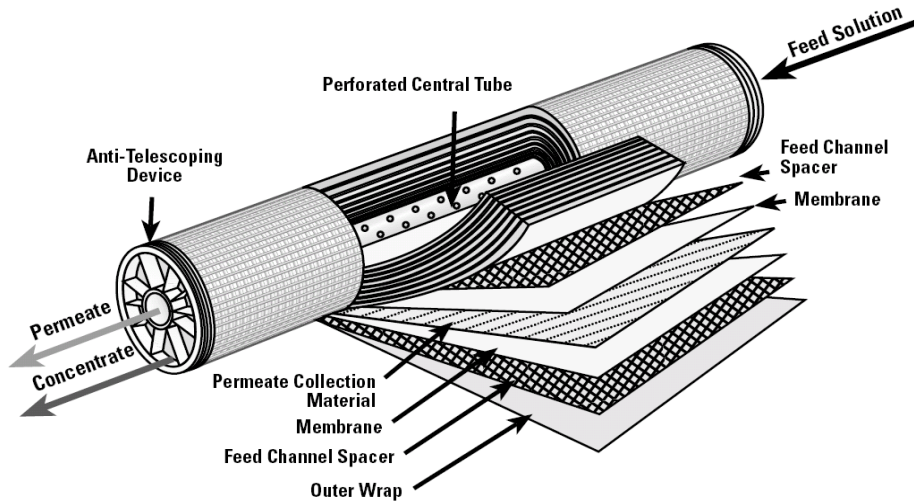
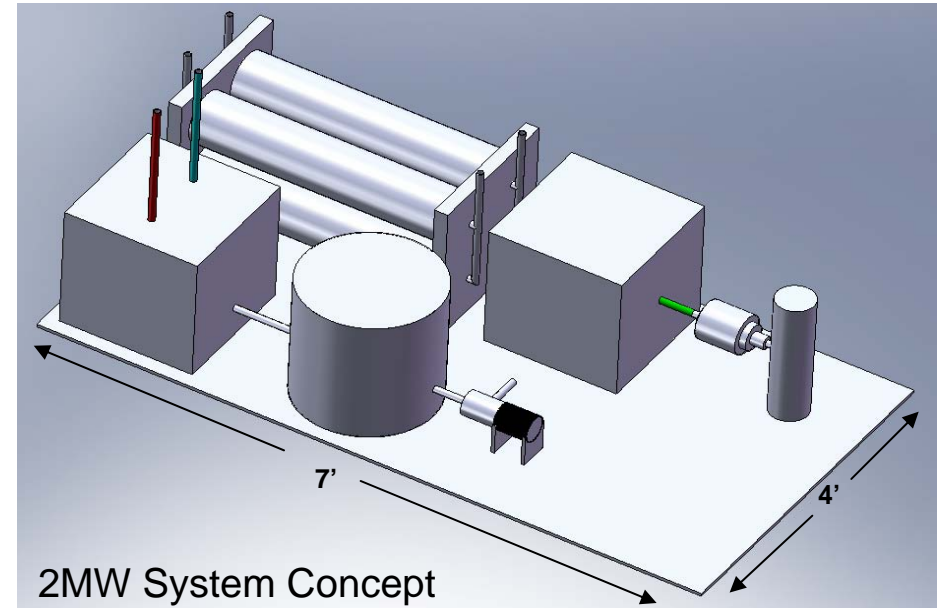
Clean fuel separated from dirty fuel in transit



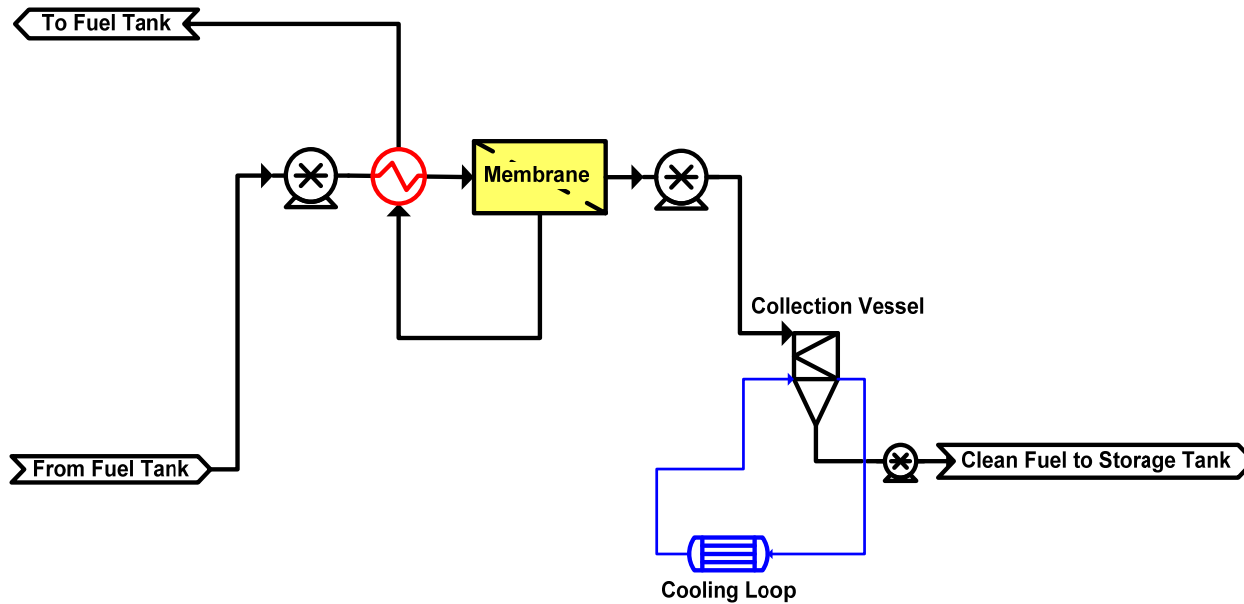
Ship uses clean fuel while at port

Membrane System Characteristics

- Spiral-wound membranes allow compact design
- Balance of plant (pumps, valves) commercially available
- Modular and scalable



Membrane System Characteristics



- Production Rate: 100kg/hr (2MW)
- Operating Temperature: 120C
- Feed Pressure: 10psig
- Sulfur Reduction: 60%
- Startup time: 1 hour

Benefits

- Low energy requirement
- Simple design
- Low capital expense
- SOx emissions reduction on the order of tons per ship per year within 24 nm
- PM emissions reduction on the order of 100s of pounds per ship per year within 24 nm

Developments/Status

Technology Supported By

- NIST-ATP
- ONR
- Boeing

Requests

- Fuel Source
- Partners
- Funding

Near Term Targets

- >90% S reduction of 20% of fuel
- Ability to process IFO
- Startup time <30 min.
- ½ current footprint
- FC system integration