



Setting the scene on Scrubbers

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**SCRUBBER TECHNICAL
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Marine Fuels Market Anatomy

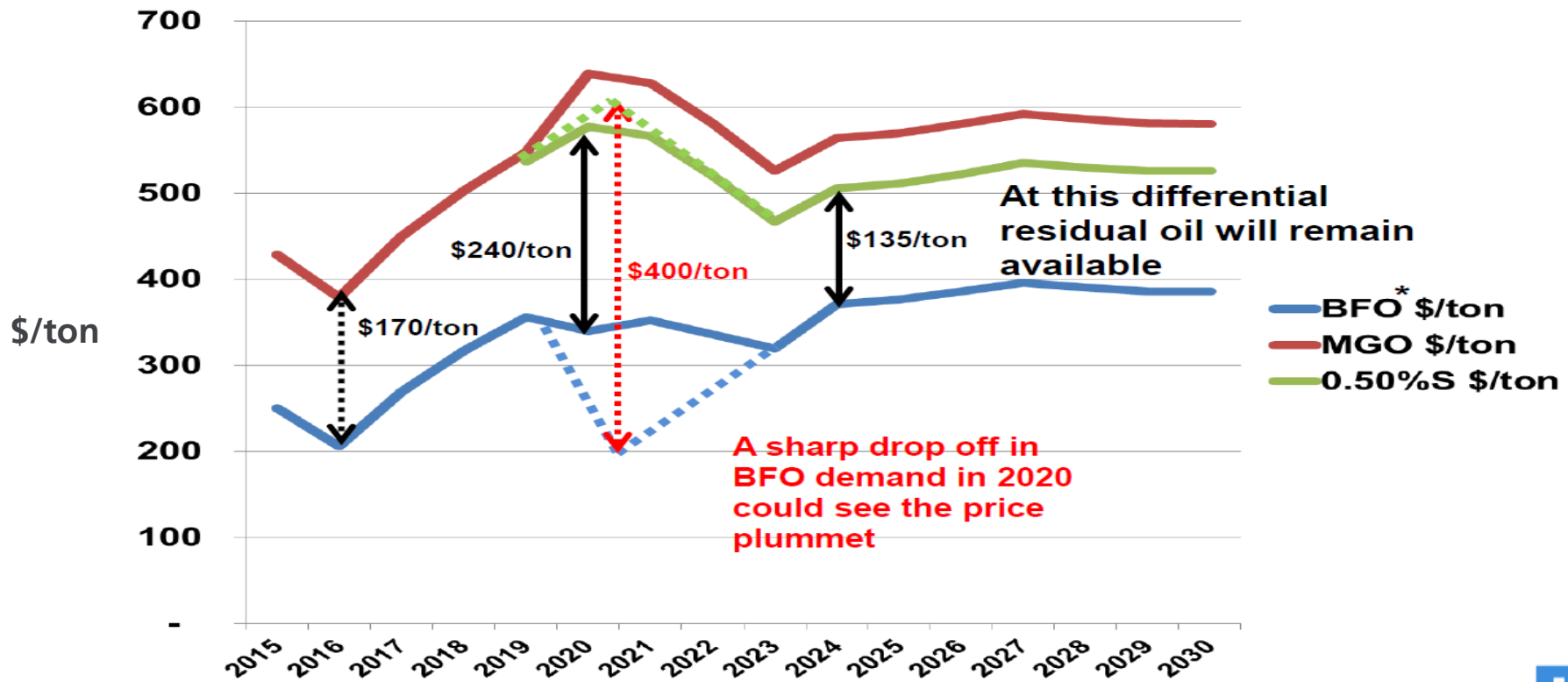
- **Marine Fuels Market today**
 - **45% of World Fuel oil and 5% of Global Middle Distillates channelled to the shipping sector**
 - **300mt Annually consisting of 80% HFO and 20% distillates**
- **Marine Fuels Market after 2020**
 - **The 2020 transition will lead to a 35 % deficit in Fuel Oil demand globally and**
 - **15% increase in demand for Middle distillates globally**

Seems like the Fuel Oil market more difficult to adapt than the distillates market

Not all refineries will follow the same strategy lack of flexibility can produce regional imbalances



Let's think different , what do we think Fuel prices will do:



* High Sulphur Bunker Fuel Oil

Source: Marine and Energy Consulting Limited, March 2017



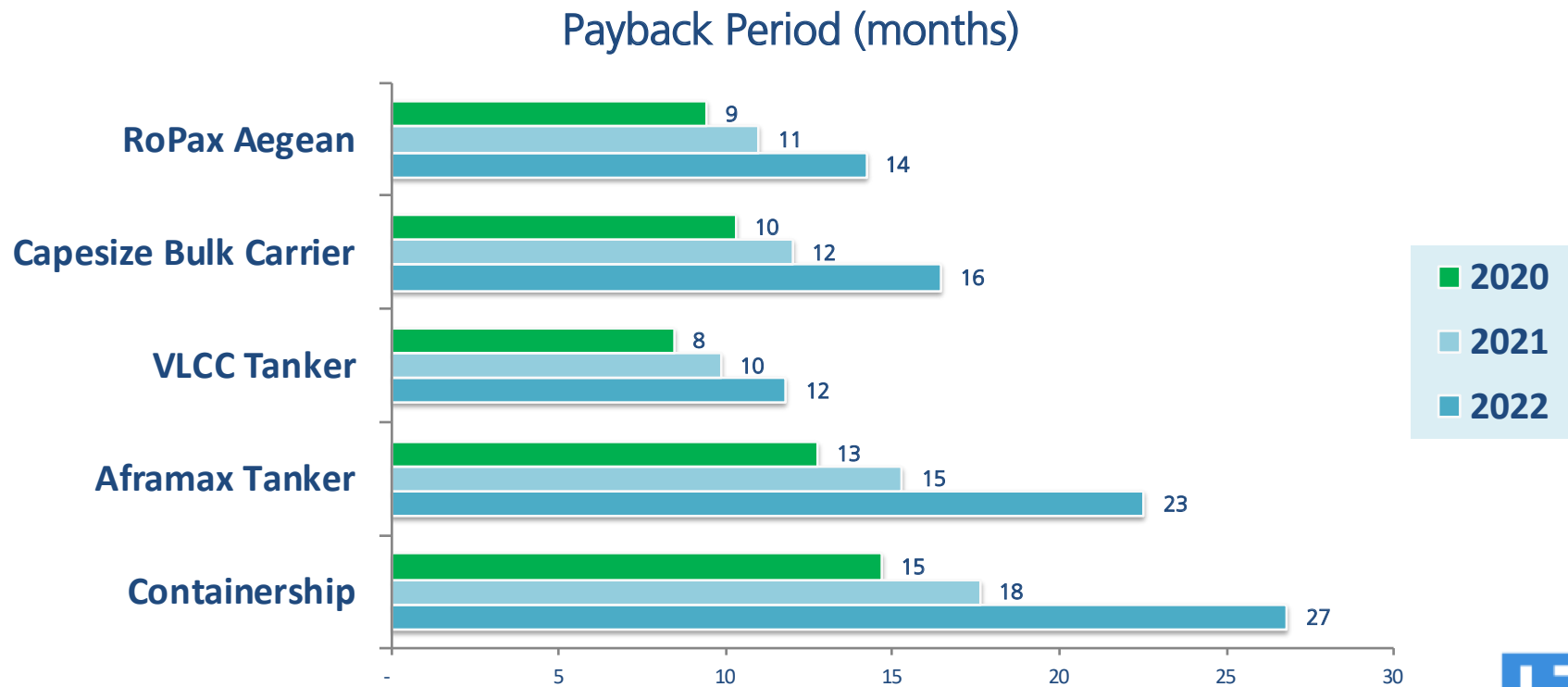
Scrubber Return Cash Flow:

How do daily scrubber returns compare to time charter rates

<i>Shiptypes</i>	Containership	Aframax	VLCC	Capesize	Ro-Pax
Daily Consumption (t/day)	30	37	65	40	35
High Return (Max Cap)	12,000	14,800	26,000	16,000	14,000
Low Daily Return (Lowest Cap)	7,500	9,250	16,250	10,000	8,750
Standard Return (Stabilised Cap)	4,050	4,995	8,775	5,400	4,725
TC Long Term (\$/day)	11,350	14,750	23,500	20,375	-



Why is it that a last minute decision could come at any given moment?



Scrubbers' Anatomy – Bulk Carriers

Scrubber Penetration

Common Name	By Status			By Age Band			
	Orderbook	In Service	All	<=5yrs	6-10yrs	11-15yrs	16-20yrs
VLOC	44,37%	6,11%	14,89%	13,43%	2,04%	0,00%	
Capesize	10,71%	2,40%	2,61%	7,32%	0,86%	2,78%	1,10%
Post-Panamax		0,73%	0,63%	0,00%	0,14%	6,25%	
Panamax	100,00%	1,43%	2,13%	9,23%	0,64%		
Supramax	5,46%	0,37%	0,67%	0,45%	0,29%		
Handymax		0,14%	0,14%	0,00%	0,00%		0,83%
Handysize	3,88%	0,44%	0,57%	1,04%	0,34%	0,23%	
Total	12,57%	0,97%	1,69%	2,37%	0,43%	0,89%	0,21%

Source Clarkson

Scrubbers' Anatomy – Oil Tankers

Scrubber Penetration

By Status

Common Name	Orderbook	Existing Fleet	All
UL/VLCC	26,13%	1,65%	4,89%
Suezmax	19,61%	1,13%	2,64%
Aframax Crude	8,85%	0,86%	1,68%
Panamax Tanker	8,82%	0,00%	0,61%
Handy Products	11,97%	0,71%	1,52%
Small Products/Chem	2,31%	0,02%	0,04%
Total	13,36%	0,40%	1,00%

By Age Band

<=5yrs	6-10yrs	11-15yrs	16-20yrs
6,43%	0,37%		
4,71%			
3,92%	0,16%		
1,76%	0,75%	0,50%	
0,18%			
2,10%	0,29%	0,20%	

Source Clarkson

Scrubbers' Risks

Several types of Risks

- **Operational Risks** – Crews will have to deal with at least three types of fuel. Segregation, operation and demonstration of compliance will be quite demanding,
- **Technical Risks** – Ranging from increased costs to Scrubber failures , enforcement of compliance measures,
- **Availability Risks** – A separate HFO supply chain will need to be maintained. It will be quite difficult for local suppliers to depend on 'HFO consumers',
- **Financial Risks** – The oil and refinery industry transition and adjustment with the new reality may drive any differential to lower levels while costs for maintaining the HFO storage and supply chain may vanish any remaining gains,
- **Compliance Risks** – Washwater control of discharges , enforcement issues that may arise, Crew Health Issues in dealing with rich in Sulphur fuels, Black Carbon and other air emission matters,



Setting the Scene on Scrubbers - Conclusions

- **Scrubber Rally** , the recent surge in orders and installations can be attributed to **previous lack of action** rather than a market shift to the scrubber solution,
- Despite recent trends and uptake, in **most segments** the scrubber effect will be **practically insignificant**,
- **Installations** predominantly occur in **ordebook or 1st age band vessels**, the large pool of aged non- ECO ships will compete on the same terms,
- As **new orders** now see **post 2020 deliveries** the speculative focus will **turn on retrofits**,
- **Postponement** seems more and more remote while stakeholders tend to **provide assurance** on all types of fuels availability,
- **Speculation** will lead to more projects being undertaken under **adverse circumstances** , **planning in advance**, caution on **cost** not being the **governing factor**,



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