

Suggestions for the refiners in Japan to improve competitiveness

Working Group Meeting

20 February 2018



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Solomon Benchmarking

Global Standard

Global Perspective



World's largest databases of upstream, midstream, and downstream operating performance



"Apples-to-apples" comparisons, letting you truly identify the areas where your facilities could improve



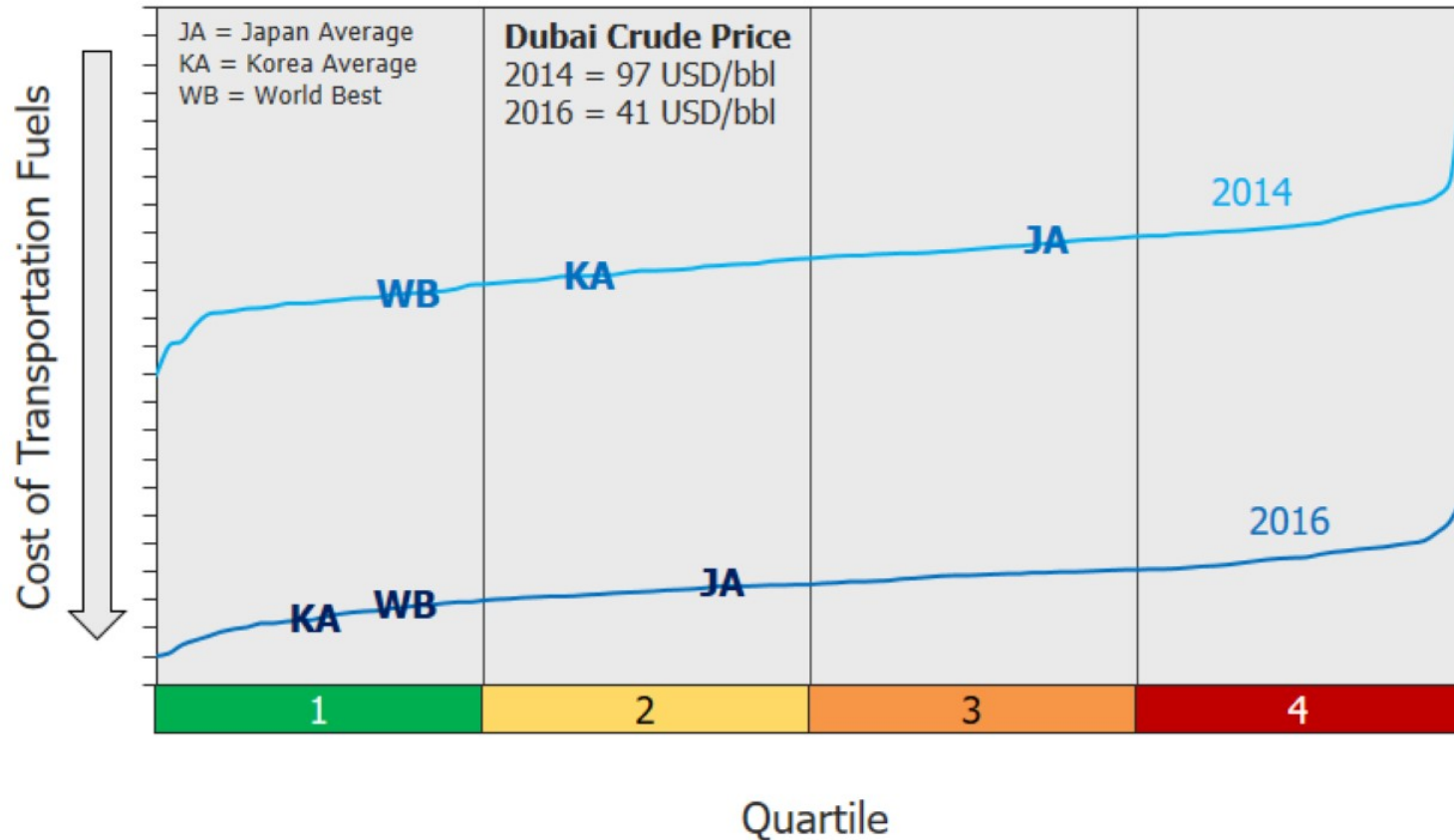
Our data are proprietary, not pulled from inconsistent, publicly available sources



85% of the world's refining capacity participates in the study

Competitiveness

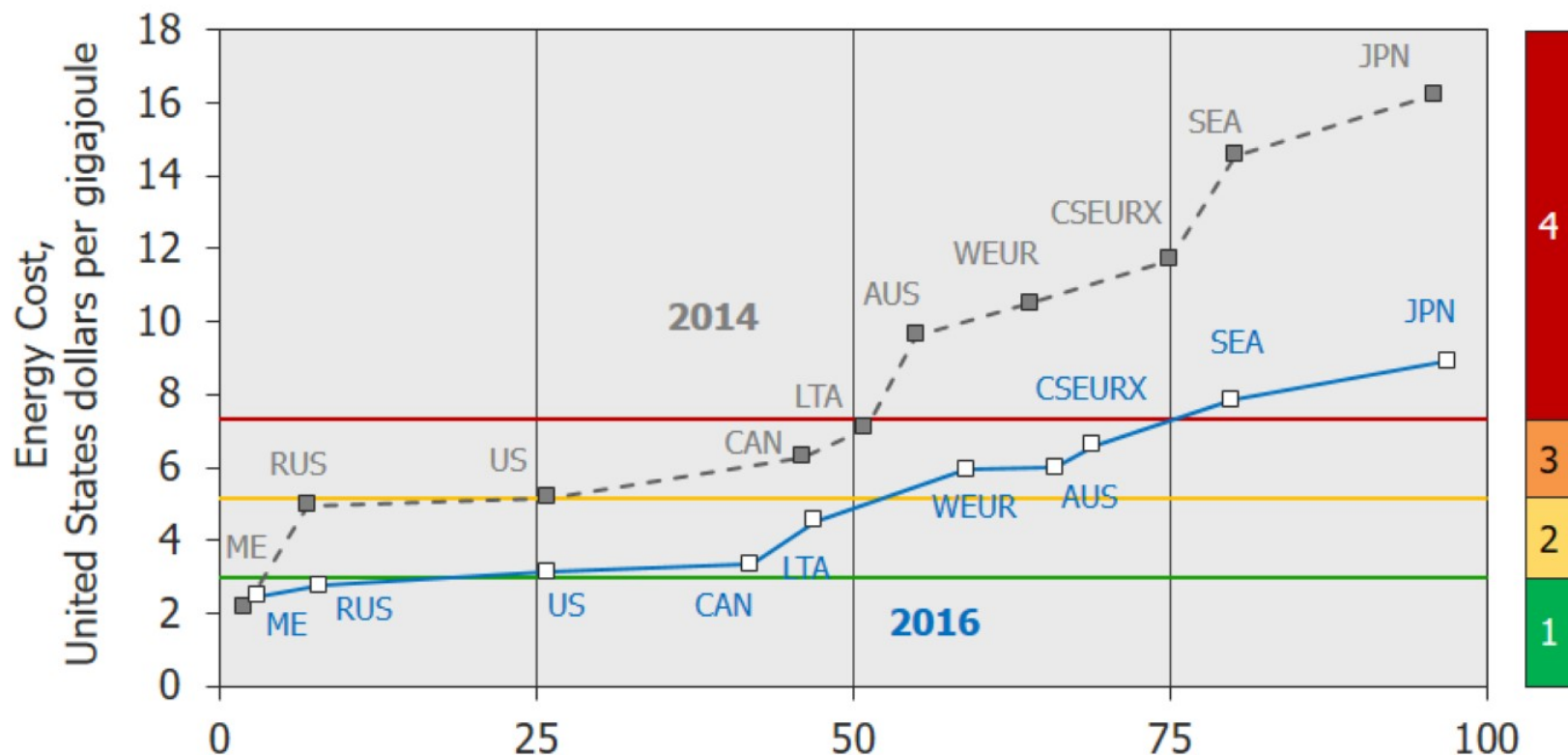
Worldwide Breakeven Production Cost Analysis



Refineries in Japan are more competitive when crude oil prices are low

Energy Cost

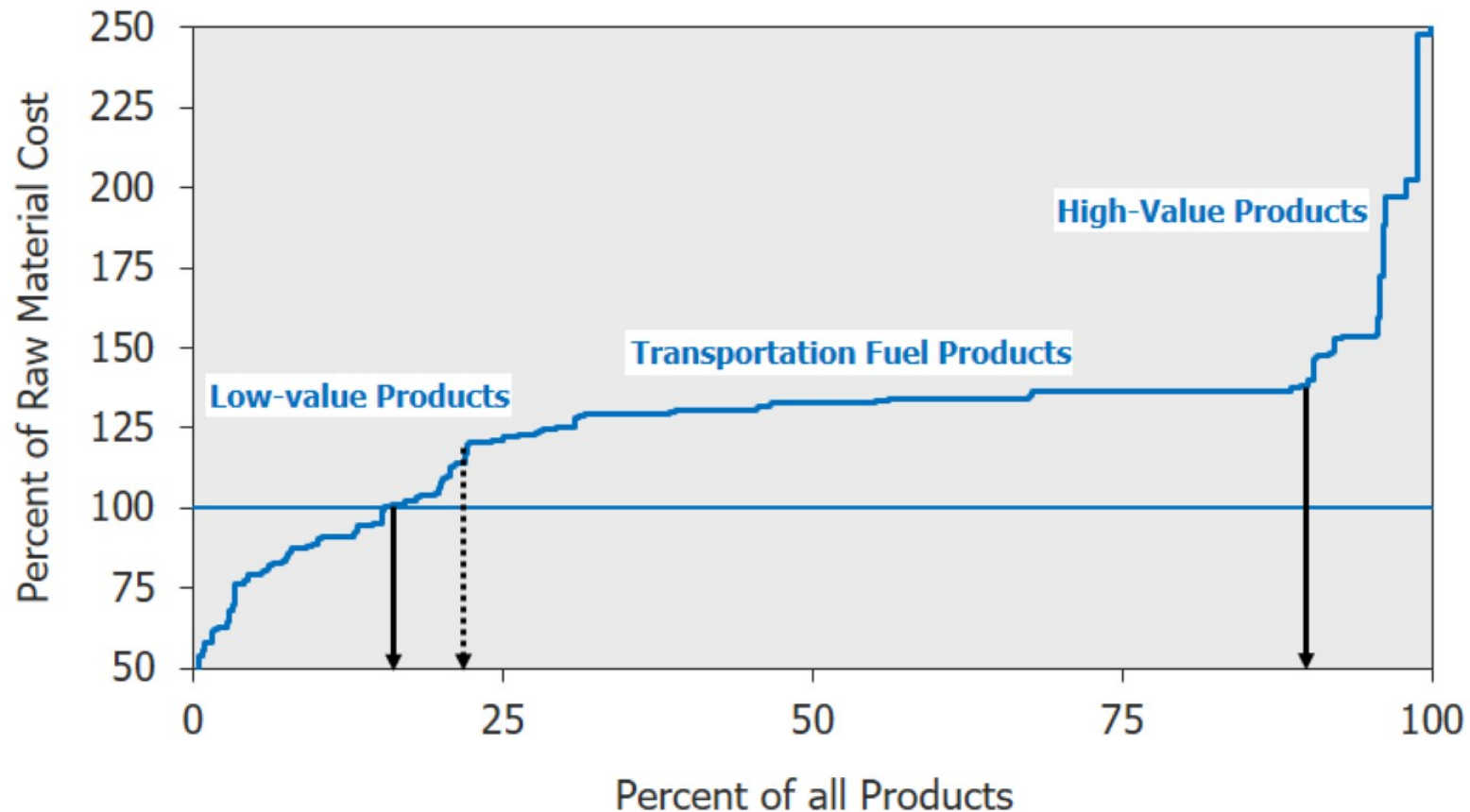
Worldwide Distributions



The large drop in energy cost between 2014 and 2016 was a significant contributor to the improved competitive performance of refineries in Japan

Product Value Distribution

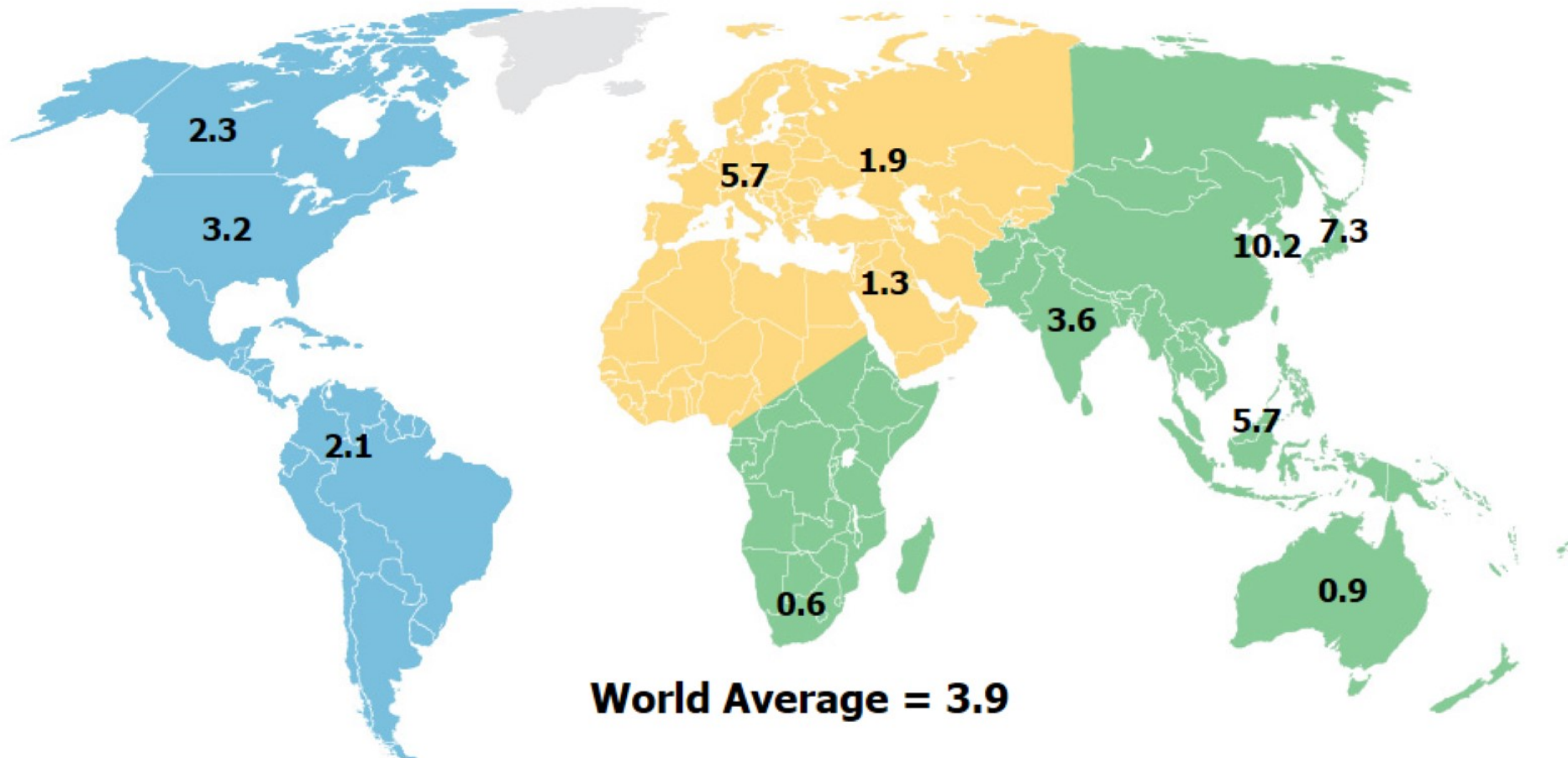
Japan Average



*Products valued less than the Raw Material Cost can be considered “scrap” products
The average refinery in Japan produced 16 vol % scrap products in calendar year 2016*

Petrochemical Intensity Averages

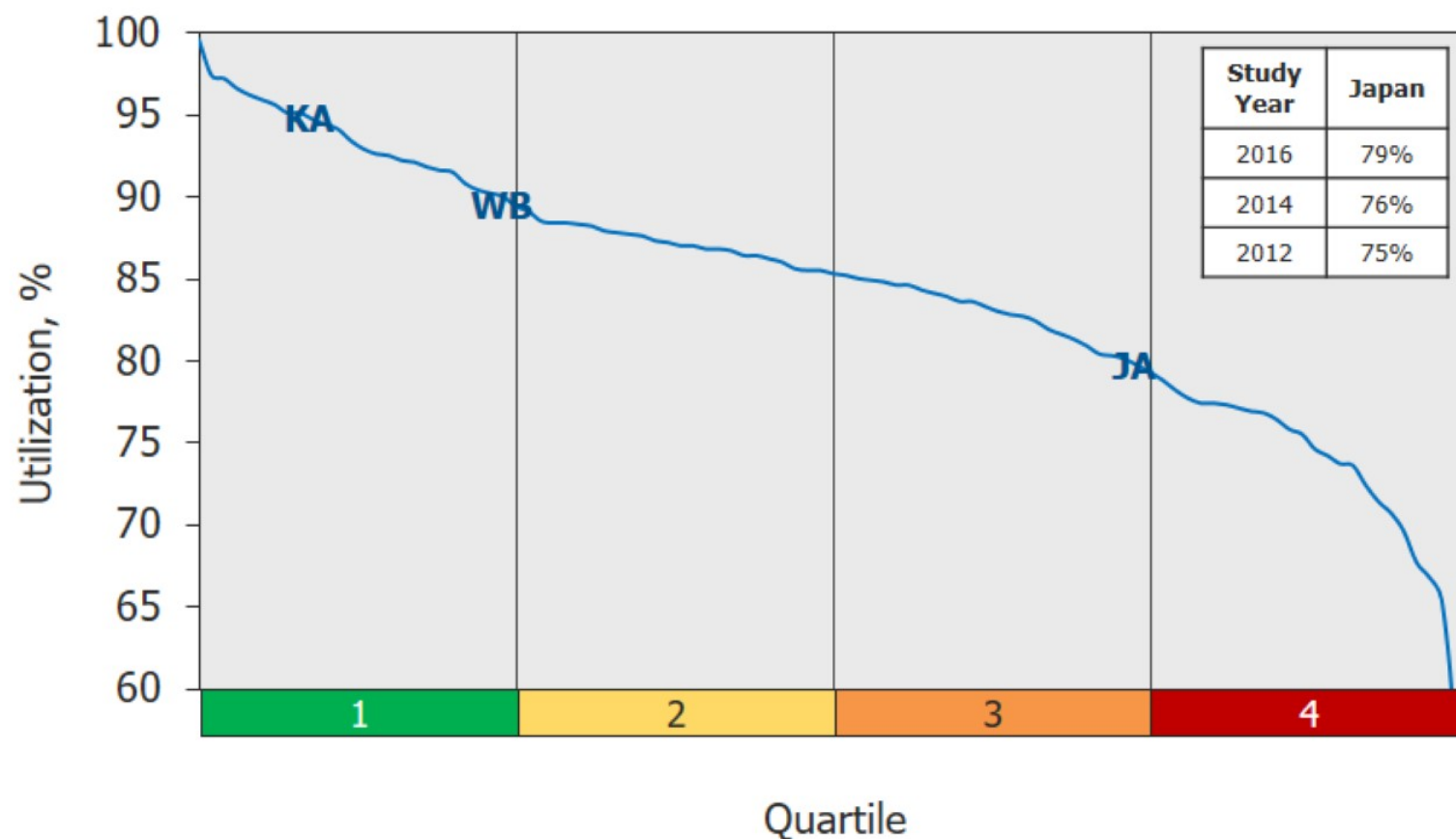
2016 Study



Petrochemical Intensity is the volume percent of refinery net input associated with reported Refinery Feed to Chemical Plants + Specialty Solvents + Petrochemicals

Resid Process Unit Capacity Utilization

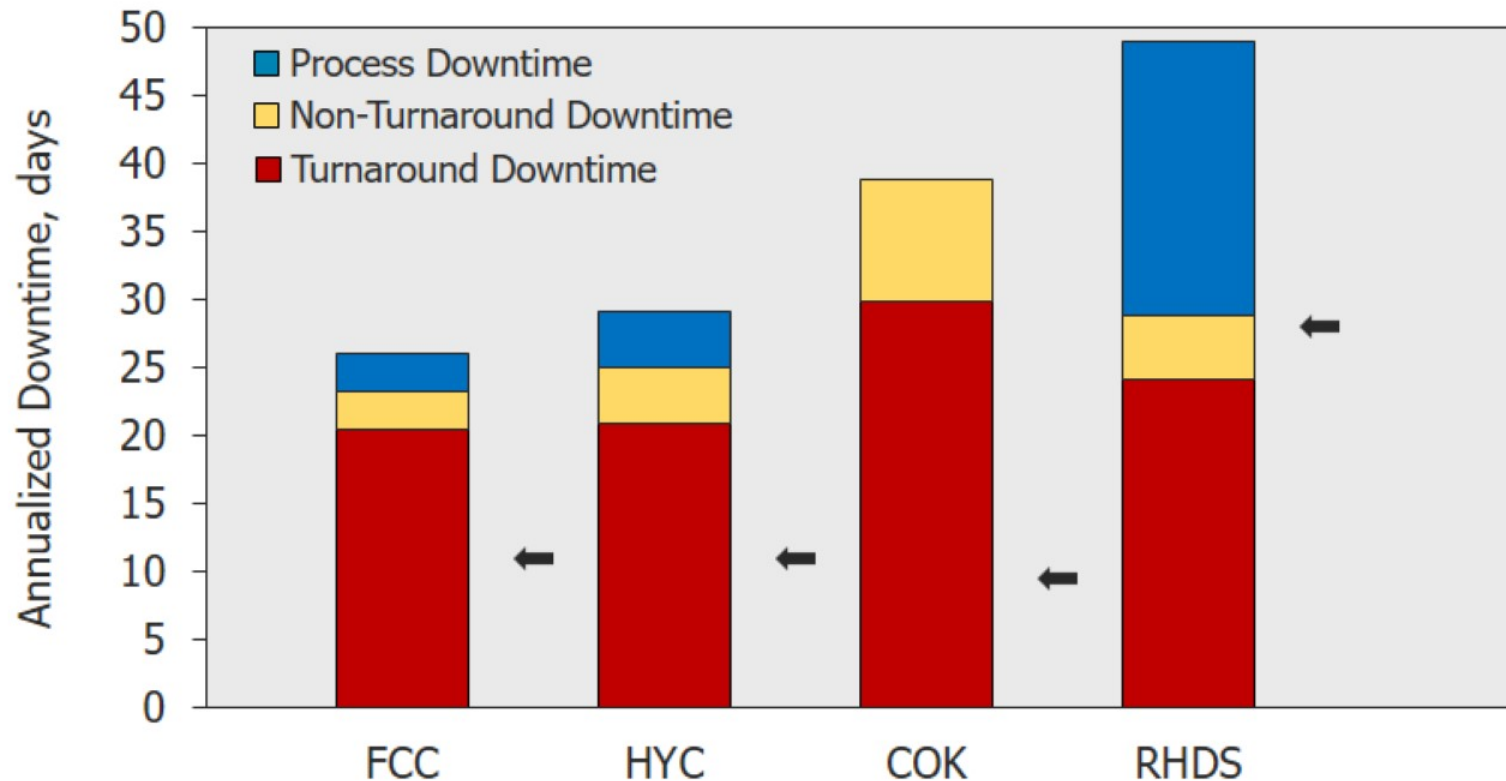
Excluding Turnaround Downtime



A significant amount of VDU, RFCC, Coking, Resid Hydrocracking, SDA, and Resid HDS capacity downstream of the Topper is underutilized in many refineries in Japan

Operational Unavailability

2016 Study



A refinery cannot be a strong competitor until it is reliable and available to operate well
Operational Availability $\geq 97\%$ is a characteristic of the best refineries in the world

Summary Suggestions for Refiners in Japan

- Continue the focus on increasing refinery reliability and the utilization of refinery complexity
- Increase by 25% to 50% the productive technical staffing levels focused on identifying and driving improvement initiatives
- Pursue ways to increase the yield of high-value products and reduce the overall “scrap” products yield (e.g., maximize recovery of available propylene, reduce clarified slurry oil yield, etc.)
- Reduce the dependence on steam as a source of heat and electrical power generation to improve energy efficiency

Refiners that achieve World's Best performance levels will be well positioned to export high-value products and technical expertise

Comparative Performance Analysis™ (CPA™)

We Benchmark the Oil & Gas Value Chain



- Exploration & Production
- Onshore Production
- Offshore Production
- FPSO
- SAGD



- Liquid Pipeline
- Natural Gas Pipeline
- Terminals
- Natural Gas & LNG Processing



- Fuels & Lube Refining
- Petrochemicals
- Integrated Sites
- Reliability & Maintenance
- Power Generation

We see the trends of change as more than

95% of companies **repeat participation** study after study.

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thank you!