
WORLDWIDE REFINERY PROCESSING REVIEW

Monitoring Technology Development and Competition in One Single Source

Second Quarter 2017

Maintenance, Reliability, and Safety

Plus

Latest Refining Technology Developments & Licensing



HYDROCARBON PUBLISHING COMPANY

Translating Knowledge into Profitability®

P.O. Box 815, Paoli, PA 19301-0815 (U.S.A.)

Phone: (610) 408-0117/ Fax: (610) 408-0118

Review@Hydrocarbonpublishing.com

TABLE OF CONTENTS

2Q 2017 Review Maintenance, Reliability, and Safety

1.	INTRODUCTION.....	1
2.	MAINTENANCE, RELIABILITY, AND SAFETY	5
2.1	MARKET/TECHNOLOGY TRENDS & OPPORTUNITIES	5
2.1.1	<i>Introduction.....</i>	5
2.1.2	<i>Market Conditions and Outlook.....</i>	5
2.1.2.1	Industry Challenges and Technology Drivers.....	5
2.1.2.2	Economic Impact of Maintenance, Reliability, and Safety Issues	7
2.1.3	<i>Technology Directions, Competition, and Future Outlook</i>	<i>10</i>
2.1.3.1	Technology Vendors Focus on Turnkey Offerings	10
2.1.3.2	Unit-by-Unit Reliability and Safety Issues.....	10
2.1.3.3	Latest Developments in Refinery Maintenance, Reliability, and Safety	12
2.1.4	<i>Conclusion</i>	<i>14</i>
2.2	STATE-OF-THE-ART TECHNOLOGY.....	14
2.2.1	<i>Asset Performance Management.....</i>	<i>14</i>
2.2.1.1	Reliability Centered Maintenance	15
2.2.1.2	Risk-based Inspection	16
2.2.1.3	Root Cause Analysis.....	17
2.2.1.4	Reactive and Proactive Maintenance	17
2.2.1.4.1	Equipment Critical Analysis.....	19
2.2.1.4.2	Operator-performed Preventive Maintenance (OPPM)	19
2.2.1.5	Asset Reliability Programs	20
2.2.1.6	Turnarounds	22
2.2.1.6.1	Accessing Asset Health Information	23
2.2.1.6.2	Scope Selection Optimization	24
2.2.1.6.3	Benchmarking.....	25
2.2.2	<i>Digital Automation.....</i>	<i>25</i>
2.2.2.1	Smart Field Devices.....	25
2.2.2.2	Standard Communication Protocols.....	27
2.2.2.3	Wireless Technologies	28
2.2.2.4	Industrial Internet of Things (IIoT).....	30
2.2.2.4.1	Connected Data	31
2.2.2.4.2	Big Data and Predictive Analytics.....	32
2.2.3	<i>Inspection and Monitoring.....</i>	<i>34</i>
2.2.3.1	Non-destructive Testing	34
2.2.3.2	Laboratory Evaluation.....	35
2.2.4	<i>Commercially Available Automation, Control, and Asset Management Technologies.....</i>	<i>35</i>
2.2.4.1	ABB Automation	36
2.2.4.2	AP-Networks.....	37
2.2.4.3	AspenTech	38
2.2.4.4	Emerson.....	40
2.2.4.5	Flowserve.....	43
2.2.4.6	Honeywell Process Solutions	44
2.2.4.7	IFS.....	46
2.2.4.8	KBC	47
2.2.4.9	Metso	48
2.2.4.10	Rockwell Automation	49
2.2.4.11	Schneider Electric	50
2.2.4.12	Solomon Associates.....	52
2.2.4.13	Yokogawa	53

TABLE OF CONTENTS

2.3	PLANT OPERATIONS AND PRACTICES	54
2.3.1	<i>Laser Scanning for Improved Maintenance and Safety</i>	54
2.3.2	<i>Turnaround Challenges and Successes</i>	55
2.3.3	<i>Health and Safety Management during Refinery Turnarounds</i>	58
2.3.4	<i>Commercial Examples of the Advantages of Connected Data</i>	59
2.3.5	<i>Improving Human Reliability</i>	60
2.3.6	<i>Impact of Materials Science on Refinery Reliability</i>	61
2.3.7	<i>Refinery Process Safety Management</i>	62
2.3.8	<i>Integrated Approach to Process Safety Management</i>	64
2.3.9	<i>Case Study: Implementing PSM Metrics</i>	65
2.3.10	<i>Integrity Operating Windows for Process Safety Management</i>	66
2.3.11	<i>Designing Safety Instrumented Systems</i>	67
2.3.12	<i>Risk Management through Independent Verification</i>	68
2.3.13	<i>Maintenance, Reliability, and Safety Issues for Individual Processing Units</i>	69
2.3.13.1	Crude Blending, Treating, and Desalting	70
2.3.13.2	CDU/VDU and Crude Preheat Train.....	72
2.3.13.3	Fluid Catalytic Cracking	75
2.3.13.4	Hydrocracking	79
2.3.13.5	Hydrotreating	81
2.3.13.6	Catalytic Reforming	83
2.3.13.7	Isomerization.....	85
2.3.13.8	Coking and Visbreaking/Thermal Cracking.....	86
2.3.13.9	Solvent Deasphalting.....	90
2.3.13.10	Alkylation	90
2.3.13.11	Gas Plant and Flare Gas System	91
2.3.13.12	Product Treating, Sulfur Plant, and Amine Systems	93
2.3.13.13	Hydrogen Plant.....	95
2.3.13.14	Lube Oil Production	96
2.3.13.15	Utilities Systems and Auxiliary Equipment/Processes.....	97
2.4	REFERENCES.....	100