

# **AFPM Q&A and Technology Forum 2015**

## **Hydroprocessing**

New Orleans, Louisiana, USA  
4 October 2015

ISBN: 978-1-5108-2559-8

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2015) by American Fuel & Petrochemical Manufacturers (AFPM)  
All rights reserved.

Printed by Curran Associates, Inc. (2016)

For permission requests, please contact American Fuel & Petrochemical Manufacturers (AFPM)  
at the address below.

American Fuel & Petrochemical Manufacturers (AFPM)  
1667 K Street, NW, Suite 700  
Washington DC 20006  
USA

Phone: (202) 457-0480  
Fax: (202) 457-1486

[info@afpm.org](mailto:info@afpm.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

## TABLE OF CONTENTS

HYDROPROCESSING.....	5
Introduction to Seminar .....	5
Introduction of Panelists .....	5
Safety .....	7
Question 29: What are the likely causes for temperature excursion events in a hydrogen plant?.....	7
Question 29: Answer Book Responses .....	11
Question 30: What factors influence your decision to conduct air versus inert reactor entry for catalyst changeout? For air entry, what methods do you use to avoid stress corrosion cracking?.....	18
Question 30: Answer Book Responses .....	22
Question 31: What are your current safe practices for sour water monitoring? What are your preferred analytical methods/sampling frequency used to measure NH <sub>3</sub> /NH <sub>4</sub> HS (ammonia/ammonium bisulfide)?.....	22
Question 31: Answer Book Responses .....	26
Feed Poisons and Fouling .....	27
Question 32: What is your suggested minimum temperature required to achieve adequate metals removal in the demetalization (demet) catalyst to protect primary treating catalyst in FCC and hydrocracker pretreaters? .....	27
Question 32: Answer Book Responses .....	33
Question 33: Phosphorus-based chemicals are used to neutralize naphthenic acids. Drilling and completion fluids also can contain phosphorus, so it may be in crude oil. What are your Best Practices to protect active hydrotreating catalyst from phosphorus poisoning?.....	33
Question 33: Answer Book Responses .....	44
Question 34: Hydroprocessing reactor pressure drop can increase due to feed particulates, corrosion byproducts and polymerization reactions. How can bed design and loading method be optimized to avoid pressure drop limiting the cycle length or throughput?..	45
Question 34: Answer Book Responses .....	51
Hydrocracking Catalysts .....	58
Question 35: What important parameters do you consider in designing a post-treat bed for a hydrocracker? What are the advantages and disadvantages between Type I and Type II catalyst when used as a post-treat bed in a hydrocracker?.....	58
Question 35: Answer Book Responses .....	63
Question 36: What has been your experience regarding selectivity and activity when using regenerated hydrocracking catalysts versus fresh catalysts? How do results vary with catalyst type, unit objectives, and conversion targets? .....	64

Question 36: Answer Book Responses .....	70
Hydrocracking Process .....	71
Question 37: What are some of your strategies for managing as oil streams during outages of conversion units for refiners with vacuum gas oil hydrocracking and FCC units?.....	71
Question 37: Answer Book Responses .....	77
Question 38: What are your concerns with processing FCC heavy cycle oil or slurry in a hydrocracker unit? .....	78
Question 38: Answer Book Responses .....	88
Question 39: In terms of hydrocracking, what different definitions of conversion do you use? .....	89
Question 39: Answer Book Responses .....	95
Question 40: What has been your experience regarding time required for hydrocracking operations to recover from temporary poisoning by organic nitrogen in the feed? What operational changes can be made to reduce the chance of permanent deactivation? .....	97
Question 40: Answer Book Responses .....	103
Question 41: How do you manage operating flexibility to maximize profits in a changing margin environment during a hydrocracker cycle?.....	104
Question 41: Answer Book Responses .....	108
Hydrogen.....	109
Question 42: Is the investment justified to convert an older hydrogen production unit from a solvent CO <sub>2</sub> removal system to a pressure swing adsorption (PSA) system? .....	109
Question 42: Answer Book Responses .....	113
Question 43: For PSA units, what are the typical inspection techniques, frequency of inspections, and issues discovered? What are the criteria for retiring an adsorber?.....	115
Question 43: Answer Book Response.....	116
Optimization .....	116
Question 44: What are your Best Practices for co-processing streams in hydrotreating units? .....	116
Question 44: Answer Book Responses .....	119
Question 45: What are the recent improvements in hydroprocessing units' advanced process control? What is your experience with their reliability?.....	122
Question 45: Answer Book Responses .....	128
Reliability/Mechanical Integrity .....	130
Question 46: What are the mechanical integrity implications for reactor effluent air coolers (REAC) after experiencing high-temperature exposure during emergency shutdowns or trips?.....	130
Question 46: Answer Book Response.....	132

Question 47: How does a recycle compressor driver type (steam turbine versus electric motor) affect compressor availability in hydroprocessing units? How reliable are variable speed drives?.....	132
Question 47: Answer Book Response.....	133
Question 48: What is your experience bringing hydrocracking catalyst online without ammonia attenuation? Are there alternative methods or technologies to temper catalyst activity without adding ammonia?.....	134
Question 48: Answer Book Responses.....	139
Question 49: Each hydroprocessing unit has an optimum strategy for full load-catalyst replacement: oxidized versus presulfided. How does the strategy change for a partial reload (e.g., top-bed skim or replacement)? Are there other situations when pre-activation is justified?.....	141
Question 49: Answer Book Responses.....	144
Tier 3.....	145
Question 50: How is your company planning to meet Tier 3 gasoline regulations?.....	145
Question 50: Answer Book Responses.....	149
ULSD.....	153
Question 51: What is your best method for monitoring salt level in a diesel salt dryer? What are your current guidelines for salt usage and capacity? What are your Best Practices for loading and monitoring salt dryer performance?.....	153
Question 51: Answer Book Response.....	156
Question 52: What approaches are effective for you to reduce aromatic levels in the ULSD product streams?.....	158
Question 52: Answer Book Responses.....	167
Closing Remarks.....	174