SIMPLIFY CRUDE ASSAY IMPORTING IN UNISIM DESIGN BY UTILIZING H/CAMS

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AGENDA

- UniSim Design for Refining : Overview
- Crude Assay Import using H/CAMS
- H/CAMS Crude Assay Management : Overview

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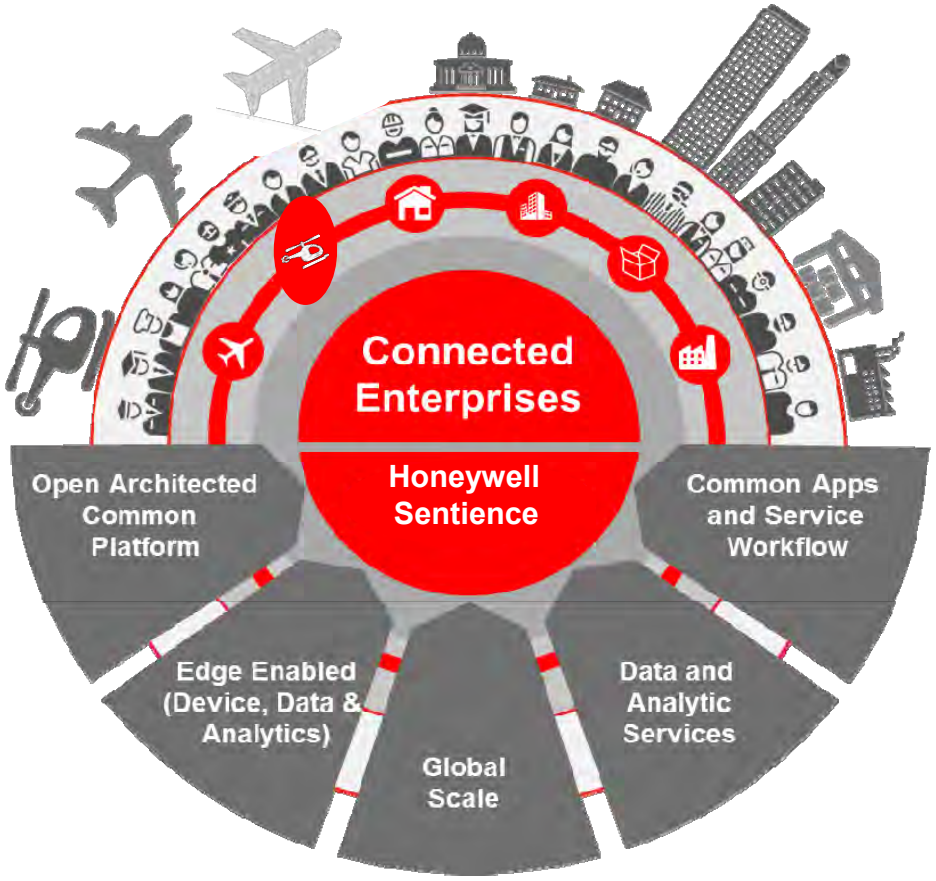
THE CONNECTED ENTERPRISE

CONNECTED AIRCRAFT

130K TOTAL AIRCRAFT



CONNECTED BUILDINGS

10M GLOBAL INSTALLED BASE

CONNECTED PLANT

10K+ GLOBAL INSTALLED BASE

CONNECTED WORKERS

550M GLOBAL PPE USERS

Accelerating Digital Transformation

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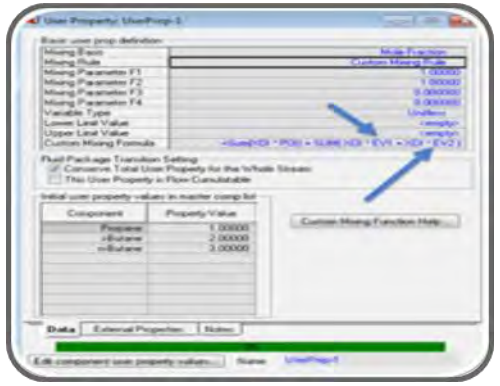
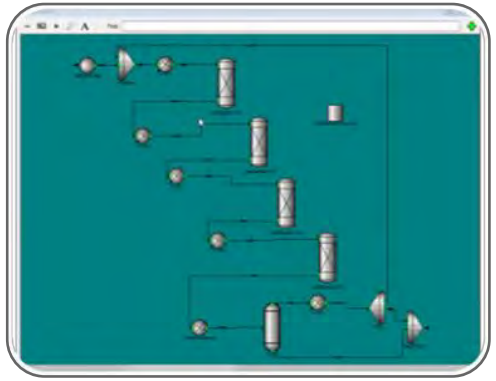
UNISIM DESIGN| NEXT GENERATION REFINING CAPABILITIES



Refinery Modelling Infrastructure

- **Refining Properties**
- **Crude Environment -** Assay Management
- **Supply Chain Integration -** LP Vector Generation



Refining Reactor Models

- **Equation Oriented Reactor Models**
- Validated by Honeywell UOP subject matter experts
- Automated and easy calibration

High Performance EO Platform

- **Equations Oriented (EO) Platform**
- Refining simulation and optimization in the same environment

Refining Workflows

- **Efficient Workflow**
- Assay synthesis, Easily import crude assays
- LP vector generation & export for planning
- Heat exchanger monitoring and optimization

UniSim Design capabilities fully meet Refining objectives

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UNISIM DESIGN SUITE | DELIVERING VALUE TO REFINERS

Supply Chain Support

Ensure LP Vectors, used in feedstock planning, are updated to accurately reflect current refinery capabilities

Unit Level Monitoring

Real-time monitoring of refinery units, leveraging EO platform, to support operations

Provides insight into predicted performance vs actual

Off-line Optimization

Enables 'what-if' analysis to provide unit optimization across the refinery

Small Debottlenecking Studies

Supports process and project engineers doing sensitivity analysis and project option evaluation

Delivering Increased Refinery Profitability

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UNISIM REFINING REACTORS

Reactor model development:

- Support from UOP experts
- Validated with UOP yield & pilot plant data
- Validated with customer data

Reactor Models Include:

- New in R470 FCC
- Reformer (Gasoline and BTX)
- Hydrocracker
- Hydrotreater
- Isomerization
- New in R470 Delayed Coker
- Alkylation

Other refining features developed and validated

- New in R470 Product Blender
- Assay Synthesis
- LP Vector
- New in R470 SRU
- Fired Heater model in EO

Refinery-wide Simulation Capability

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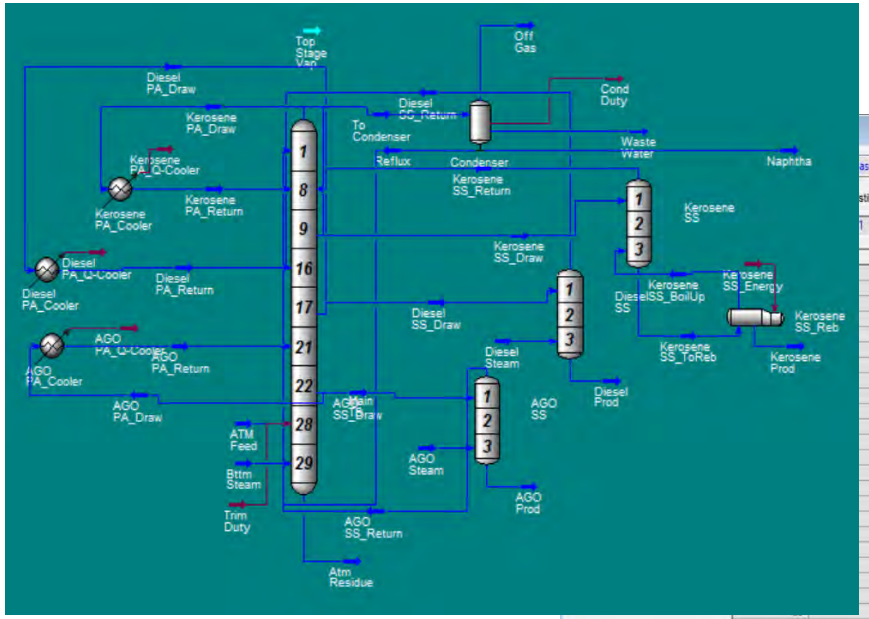
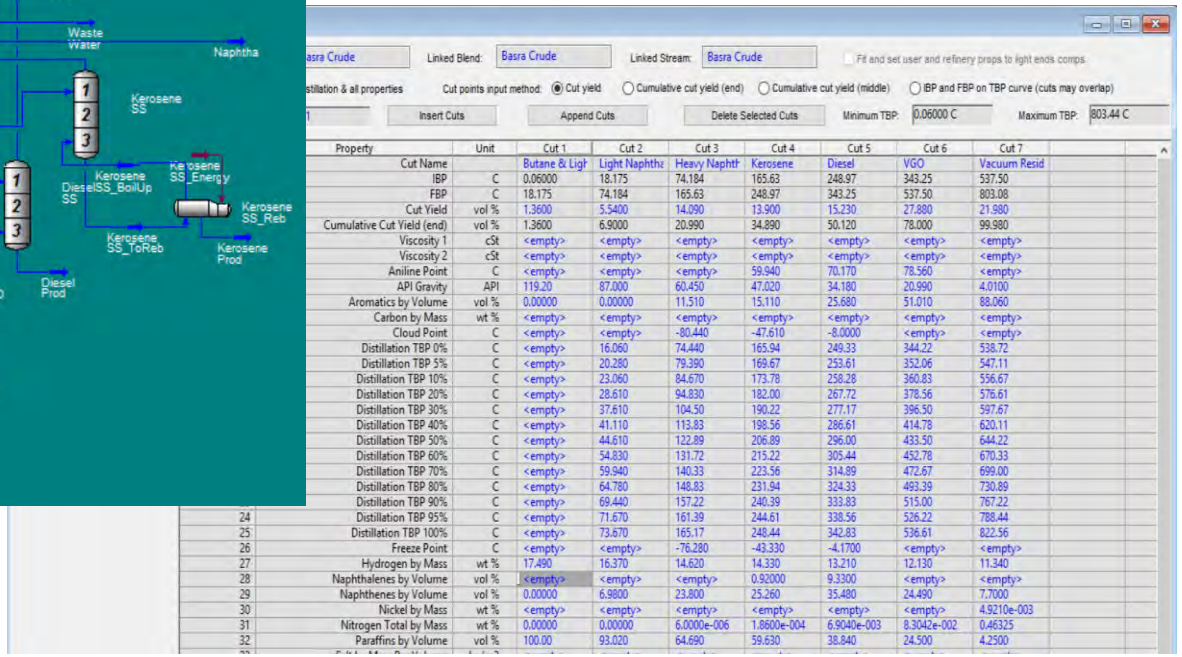
CHARACTERIZING ASSAYS

UniSim Design provides following options for crude characterization:

- Allows defining Assay, cut and blend to define your refinery feedstock
- Use newly developed ‘Assay Synthesis’ module to input and develop a property rich crude feedstock & cuts
- Import an assay from the Haverly H/CAMS database or spreadsheet format

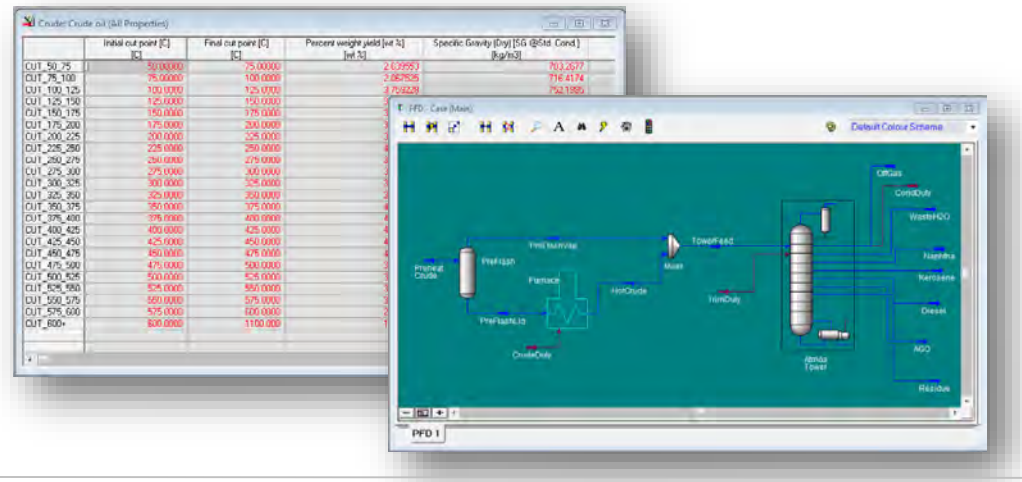


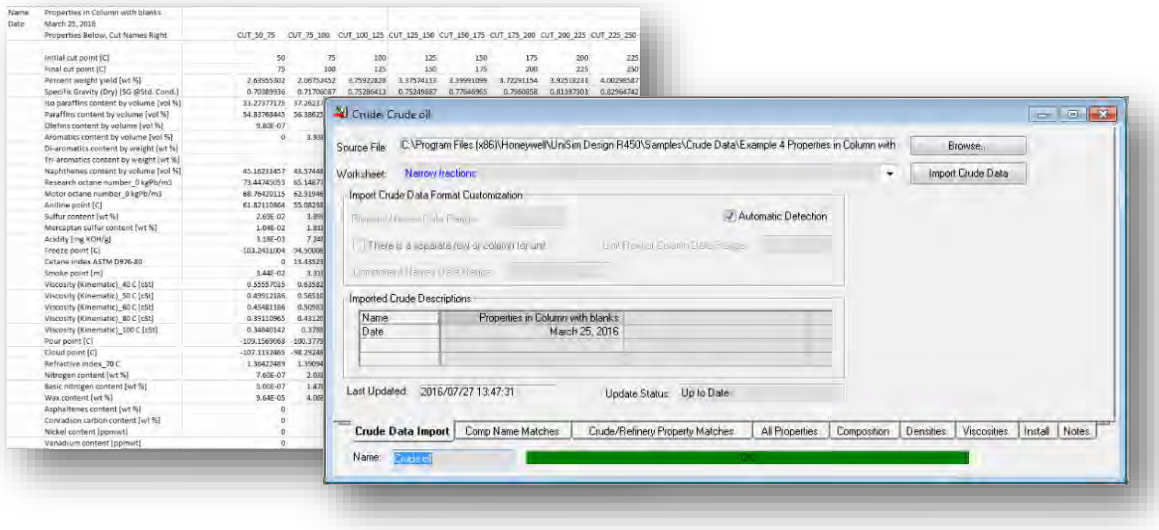


	Property	Unit	Cut 1	Cut 2	Cut 3	Cut 4	Cut 5	Cut 6	Cut 7
	Cut Name		Butane & Ligh	Light Naphtha	Heavy Naphth	Kerosene	Diesel	VGO	Vacuum Resid
	IBP	C	0.06000	18.175	74.184	165.63	248.97	343.25	537.50
	FBP	C	18.175	74.184	165.63	248.97	343.25	537.50	803.08
	Cut Yield	vol %	1.3600	5.5400	14.090	13.900	15.230	27.880	21.980
	Cumulative Cut Yield (end)	vol %	1.3600	6.9000	20.990	34.890	50.120	78.000	99.980
	Viscosity 1	cSt	<empty>	<empty>	<empty>	<empty>	<empty>	<empty>	<empty>
	Viscosity 2	cSt	<empty>	<empty>	<empty>	<empty>	<empty>	<empty>	<empty>
	Aniline Point	C	<empty>	<empty>	<empty>	59.940	70.170	78.560	<empty>
	API Gravity	API	119.20	87.000	60.450	47.020	34.180	20.990	4.0100
	Aromatics by Volume	vol %	0.00000	0.00000	11.510	15.110	25.680	51.010	88.060
	Carbon by Mass	wt %	<empty>	<empty>	<empty>	<empty>	<empty>	<empty>	<empty>
	Cloud Point	C	<empty>	<empty>	-80.440	-47.610	-8.0000	<empty>	<empty>
	Distillation TBP 0%	C	<empty>	16.060	74.440	165.94	249.33	344.22	538.72
	Distillation TBP 5%	C	<empty>	20.280	79.390	169.67	253.61	352.06	547.11
	Distillation TBP 10%	C	<empty>	23.060	84.670	173.78	258.28	360.83	556.67
	Distillation TBP 20%	C	<empty>	28.610	94.830	182.00	267.72	378.56	576.61
	Distillation TBP 30%	C	<empty>	37.610	104.50	190.22	277.17	396.50	597.67
	Distillation TBP 40%	C	<empty>	41.110	113.83	198.56	286.61	414.78	620.11
	Distillation TBP 50%	C	<empty>	44.610	122.89	206.89	296.00	433.50	644.22
	Distillation TBP 60%	C	<empty>	54.830	131.72	215.22	305.44	452.78	670.33
	Distillation TBP 70%	C	<empty>	59.940	140.33	223.56	314.89	472.67	699.00
	Distillation TBP 80%	C	<empty>	64.780	148.83	231.94	324.33	493.39	730.89
	Distillation TBP 90%	C	<empty>	69.440	157.22	240.39	333.83	515.00	767.22
24	Distillation TBP 95%	C	<empty>	71.670	161.39	244.61	338.56	526.22	788.44
25	Distillation TBP 100%	C	<empty>	73.670	165.17	248.44	342.83	536.61	822.56
26	Freeze Point	C	<empty>	<empty>	-76.280	-43.330	-4.1700	<empty>	<empty>
27	Hydrogen by Mass	wt %	17.490	16.370	14.620	14.330	13.210	12.130	11.340
28	Naphthalenes by Volume	vol %	<empty>	<empty>	<empty>	0.92000	9.3300	<empty>	<empty>
29	Naphthenes by Volume	vol %	0.00000	6.9800	23.800	25.260	35.480	24.490	7.7000
30	Nickel by Mass	wt %	<empty>	<empty>	<empty>	<empty>	<empty>	<empty>	4.9210e-003
31	Nitrogen Total by Mass	wt %	0.00000	0.00000	6.0000e-006	1.8600e-004	6.9040e-003	8.3042e-002	0.46325
32	Paraffins by Volume	vol %	100.00	93.020	64.690	59.630	38.840	24.500	4.2500

CRUDE ASSAY IMPORT FACILITY

- Import crude data from a Microsoft Excel file or Haverly H/CAMS crude file
- Assays are imported under the **UniSim Oil Manager** environment
- Crude assay **import facility** allows crude assays to be read into UniSim





- The **same** components and pseudo-components can be shared by different assays
- The assays are **propagated in flowsheet** environment

Users can now import hundreds of assays with a few clicks!

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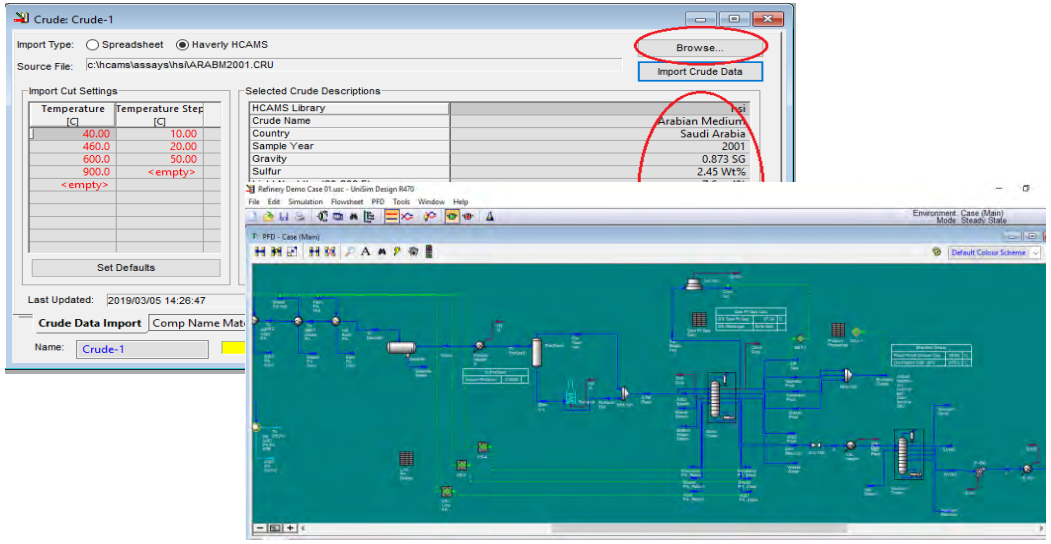
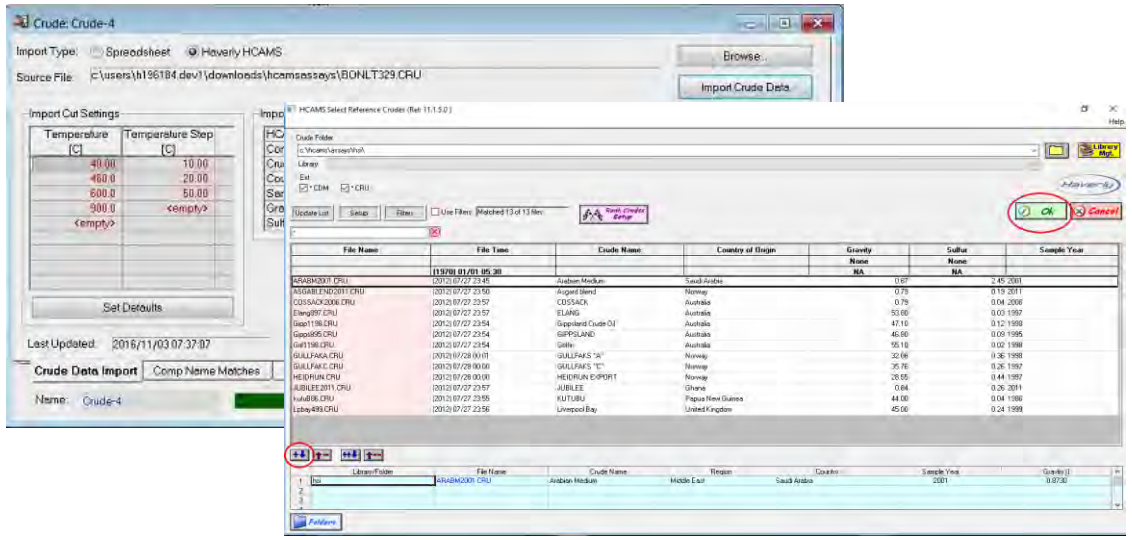
UNISIM DESIGN | LINK TO HAVERLY H/CAMS

- UniSim Design links to **Haverly H/CAMS** via a COM interface
- Haverly H/CAMS is the industry leading assay crude management software with **over 4400 plus** assays
  - 2820 Chevron assays
  - 730 Haverly assays
  - 920 Philips 66





- Possible to also include proprietary assays
- The crude assay import facility makes it **easy to import** and manage crude assays
- This functionality increases **engineering effectiveness**, eliminates room for manual data entry, and makes it easier to model crude storage facilities and refining processes

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website: www.Haverly.com

Haverly Systems : Oil and Gas
Software provider since **1962**

Offices :

- New Jersey (HQ)
- California
- Texas
- United Kingdom
- Singapore
- Lebanon

Local Representatives :

India
China
Pakistan
South Africa
Kuwait
Saudi Arabia
Venezuela
….

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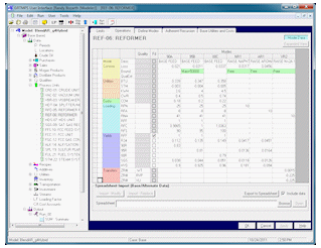
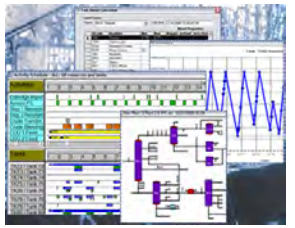
Haverly Integrated Products

H/CAMS
Crude Assay Management

G5 (GRTMPS)
Planning & Optimization



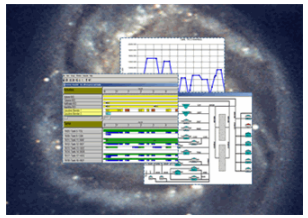
H/Sched
Interactive Refinery Scheduling



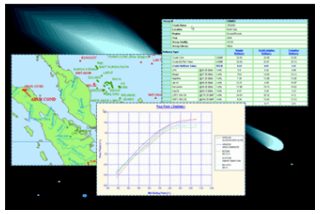
Crude Assay Libraries
Chevron, Haverly...

Integration Tools
Many applications linking Haverly products and to other software

H/Gal-XE
Gasoline production blending & scheduling



H/COMET
Web-based crude oil evaluation tool for refiners, traders, producers



Phone Apps
Property Calculator
H/COMET App

NetBlend
Web-based gasoline & product blending optimization

Crude Assay Management

- Approx. 400 sites worldwide, 1000’S of users
- Standalone (H/CAMS) and Cloud (H/COMET)
  - Oil Company Corporate Offices
  - Refineries
  - Engineering Firms
  - Research Organizations and Laboratories
  - Trading Companies and Banks
  - Oil Production Companies
  - Energy Consultants

Crude Assay Management (H/CAMS)

- Powerful Engineering Tool
  - Advanced prediction techniques
  - Extensive list of supported qualities (350+)
  - Sophisticated techniques (Optimized Crude Blends, Crude Ranking, Tray Efficiency, Cut Spec Adjustment, Flash assay updates, etc.)

Crude Assay Management (H/CAMS)

- Supported by commercial assay libraries
  - Chevron
  - Phillips 66
  - Haverly/PTI
- Interfaces seamlessly to many other applications, such as LP Planning and Process Simulation





FOR MORE INFORMATION, CONTACT:

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