



MINICUT ASSAY SYSTEM OVERVIEW

**Crude Oil Quality Group Meeting
Philadelphia, PA
June 18, 2009**

**Steve Graybill
Nexidea, Incorporated**

Minicut Assay System Background

HPI Consultants, Inc.

- Minicut Assay System founded upon work of HPI Consultants, Inc.
 - Issued assay libraries in 1981, 1987, and 1995
 - Developed the Assay Simulator in 2002

NEXIDEA, Incorporated

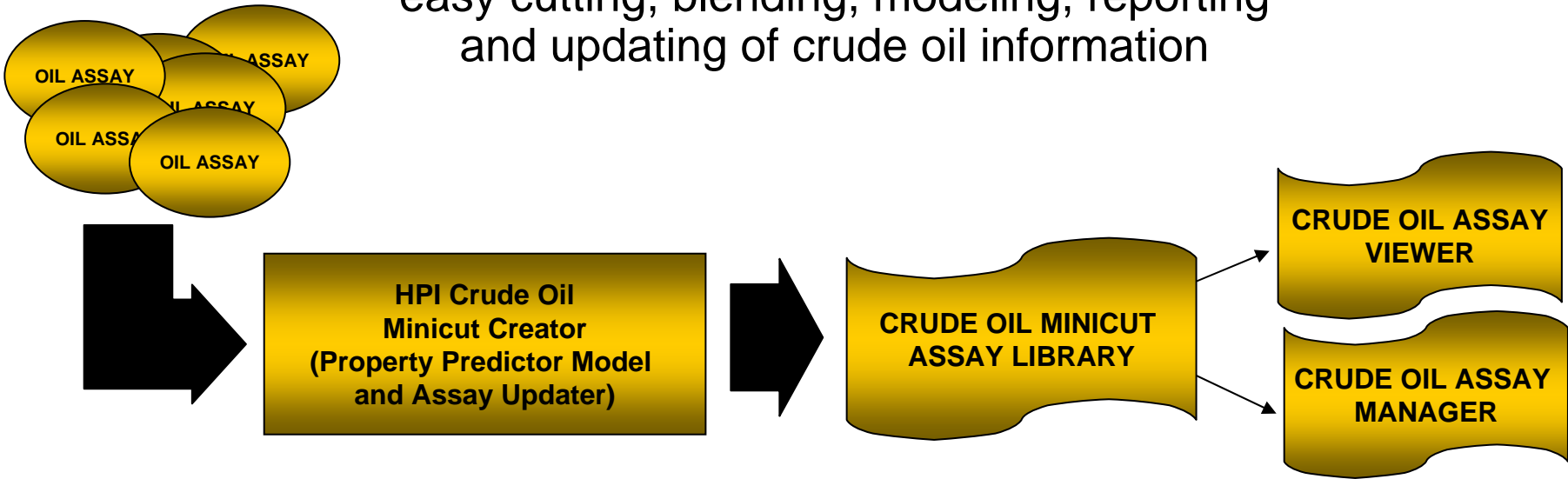
- Minicut Assay Library developed through a three-year effort between NEXIDEA and HPI Consultants

Nexidea Systems, Inc.

- HPI Consultants acquired by Nexidea Systems in 2008

Minicut Assay System Concept

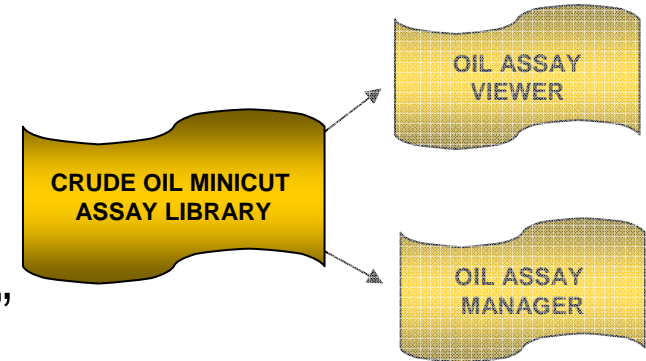
An assay management system that allows easy cutting, blending, modeling, reporting and updating of crude oil information



Minicut Assay Library

Overview

- Minicut assays present crude oil assay data in standardized Excel[®] files with properties reported in small “minicuts”

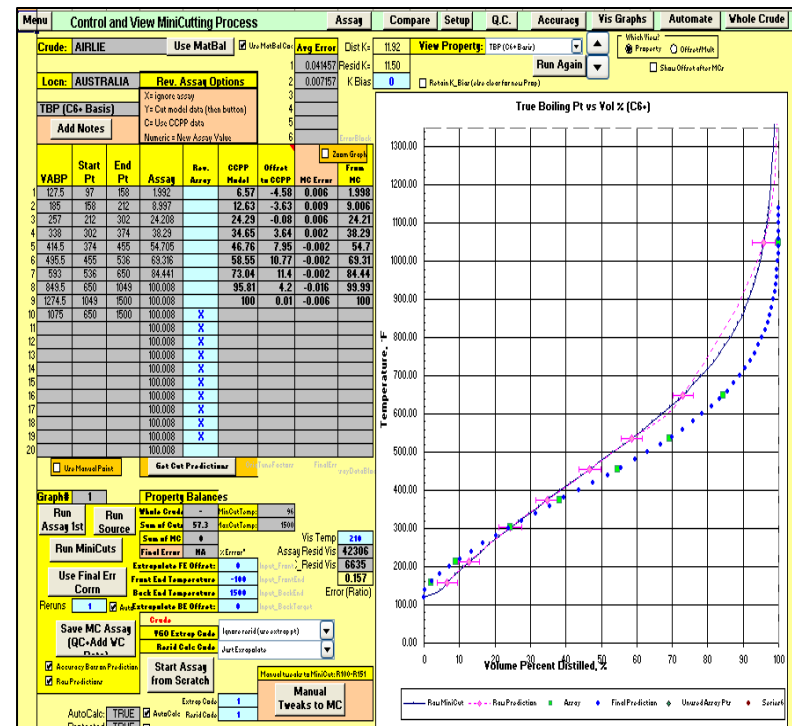
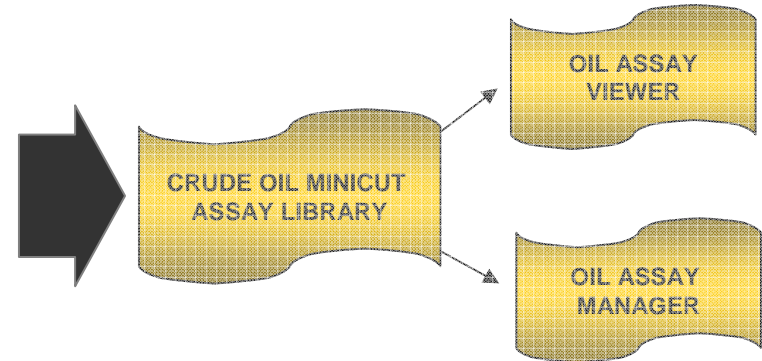


- Assays created by NEXIDEA using Nexidea Systems’ Minicut Creator
- 2009 Library:
 - Over 330 crude oils
 - Over 90 assays – 2006 or newer
- Updated and expanded regularly
- Client assays can be minicut for client-confidential libraries

Creating Reliable Assays

We do the work!

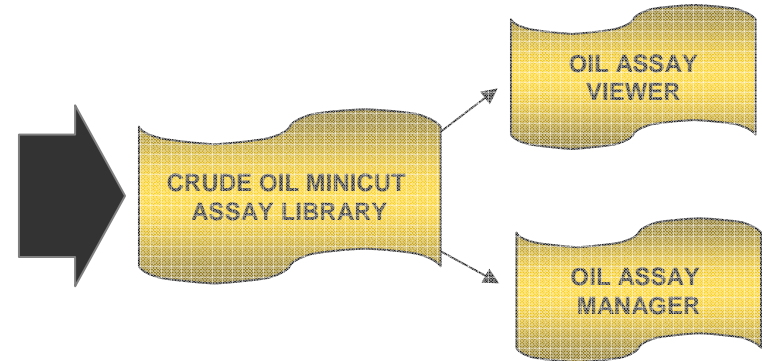
- NEXIDEA uses the Minicut Creator to model yields/properties and create minicuts which match the original assay.
- The Minicut Creator relies on HPI's Crude Cut Property Prediction CCPP correlations developed from neural network analysis presented to COQG.
- Quality Control Measures
 - Assembly of good team
 - Checks on base assay
 - Checks during minicutting process
 - QC sheet created on completion
 - Follow-up checks on overall library



Creating Reliable Assays

Base Assay Considerations

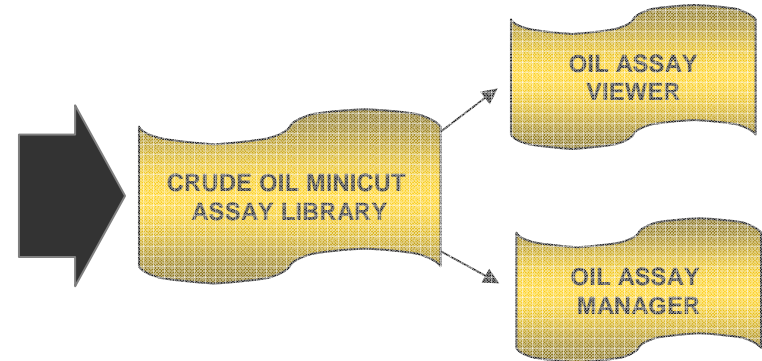
- “Garbage In – Garbage Out”
- Units of Measure
- Material Balance Checks
 - Specific Gravity Checks
 - Sum of cuts adds to 100% using calculated Whole Crude Gravity
 - Look for slight increase in API between Reported and Calculated
 - Contaminant Checks (Sulfur, Nitrogen, Concarbon, Metals)
 - Reported Whole Crude Value Versus Calculated (Sum of Cuts)
- Completeness of Assay – Number of Cuts and Properties Analyzed
- Comparison of Whole Crude Properties with Current Production



Creating Reliable Assays

Crude Oil Updater

- Updates MC assays based upon changes in whole crude properties
 - API gravity
 - Light ends composition
 - Contaminants

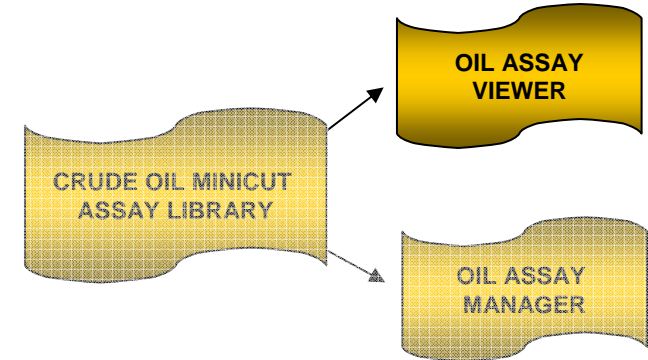


- HPI Consultants Crude Oil Quality Group Meeting Presentation
The Assay Simulator – Crude Assay Modeling based on Simple Whole Crude Properties (January 2003 Meeting)
- Uses offsets to CCPP predictions established from a base assay
- Appropriate for changes to the same production field

Assay Viewer

Provides crude oil assay properties in user-defined cuts and Excel® formats

- Functions:
- **Select** – List, sort, and select assays
 - **Setup** – Specify cuts, temperatures and property codes
 - **Format** – Create new or use an existing assay format of user-defined functions
 - **View** – View, print, or copy results



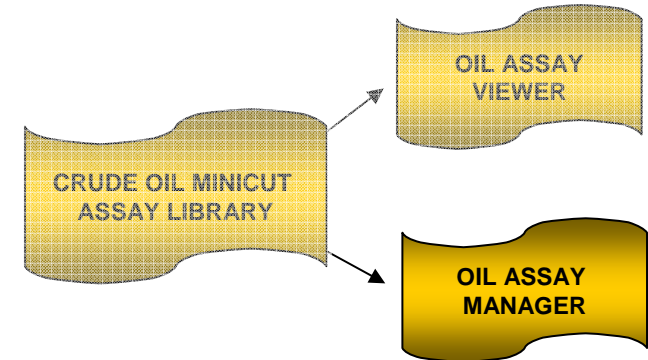
Example user-defined function
(wt% sulfur of 400-450°F cut):
 $\text{=CutProp(StartCut,EndCut,Property)}$
 $\text{=CutProp(400,450,Sulf)}$
 = 0.1136

Grid Pattern Assay		Setup	Assay List	View LP Template	Print Assay	<input type="checkbox"/> Force Active (off for editing)															
Crude Oil Assay																					
Crude		Oman																			
CRUDE PROPERTIES																					
Gravity, degrees API		33.0																			
Specific Gravity (60 F/60 F)		0.8800																			
Total Sulfur, wt. pct.		1.11																			
Total Nitrogen, ppmw		1325																			
Pour Point, degrees F		-42																			
Viscosity at 70 deg. F, cs		22.4																			
Viscosity at 100 deg. F, cs		12.38																			
Vanadium, ppm wt		2																			
Nickel, ppm wt		1																			
PRODUCT PROPERTIES																					
TBP Cut Points, degrees F			CNYC4	iC5n/C5	C6H8	180/200	300/400	400/450	450/500	500/550	650/700	700/800	900/1050	900/1050							
Yield, wt. pct.	D	127	0.72	4.5	7.87	7.03	3.8	4.18	12.83	4.25	16.72	10.69	25.93								
Vol. Yield, Vol. pct.	D	192	0.98	5.73	9.23	7.83	4.3	4.41	13.09	4.19	15.97	9.79	22.6								
API	D	117.6	83.9	78.2	61.7	52	45.9	42.1	35.7	30.8	25.9	19.4	12.1								
SpGr	D	0.5681	0.6277	0.6747	0.7323	0.7711	0.7974	0.8149	0.8461	0.8714	0.8993	0.9380	0.9696								
Sulf	D	0.0000	0.0000	0.0009	0.0251	0.0549	0.119	0.217	0.5871	0.8898	1.0705	1.4487	2.498								
Mercap	N	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0								
Nit	D	0.00	0.00	1.00	1.20	2.10	4.30	8.20	53.10	187.90	621.90	1465.40	4045.50								
AniPt	D				133.7	146.6	154.7	170.2	179.8	183.5	191.9										
Naphth	C		0.00	16.8	22.5	24.3	26.95	29.90													
Arom	D		0.00	3.3	8.4	8.9	10.8	12.4	15.3	17.4	18.8	22.1									
RONC	D		78.1	65.9	51.5	38.3	32.30	29.30													
Smoke	D				30.10	26.9	24.8	20.7													
Cetane	D				52.1	54.5	52.7	49.6													
Freeze	D				-91.40	-80.5	-37.8	16.4													
Pour	D						-66.8	-45.5	3.5	40.3	75.8	101.3	94.1								
Vis@100F	D						0.81	1.32	1.87	4.1	9.84	32.93	281.1	5985.11							
Vis@140F	D						0.63	0.96	1.29	2.52	5.27	14.15	76.81	4272.2							
Vis@210F	D						0.42	0.6	0.77	1.35	2.45	5.16	16.96	1791							
Ni	D										0.03	0.05	0.23	3.33							
Van	D										0.03	0.05	0.25	7.85							
CCl	D										0.10	0.11	0.29	15.05							
CCl	D																				

Assay Manager

Functions

- Select – List, sort, view, and select from available assays
- Blend – Blend up to 20 crude oils by weight or volume
- Create Blend Assay – Save a Minicut assay representing the blend
- Compare Assays – Compare properties of blend and other crudes
- View – View, print, or copy assay in any “view” (Assay Viewer)
- Report – Report property cut information in a side-by-side table
- Graph – Graph component properties of the blend and other crudes



Conclusion

- The Minicut Assay System makes assay management simple.
- Reliable Minicut Assay Library currently covers over 330 crude oils.
- Thanks to
 - Previous owners of HPI Consultants, Inc.
 - Mr. Cud Baird
 - Mr. Ward Davis
 - NEXIDEA Team
- Next Steps
 - Receiving your feedback!
 - Adding your assays to the Minicut Library.