Haverly’s Crude Assay Management System (H/CAMS)

H/CAMS is a comprehensive family of applications, databases and services that are dedicated to crude assay management. This document provides an overview of the software.

Users all around the globe now make routine use of H/CAMS for the following crucial tasks:

- Predict properties of crude cuts
- Determine cut points to meet selected properties
- Compare cut qualities of different crudes
- Quickly detect data anomalies and inconsistencies
- Find crudes with desired cut properties
- Apply distillation separation factors for accurate yield and property predictions
- Calibrate separation factors using test-run data
- Quickly adjust assays for changes in crude properties
- Create full assays from sparse data
- Make use of GC data to predict yields and properties
- Use in-built correlations to generate missing properties from other measured data
- Automatically smooth and extend property curves
- Create assays of blends and spiked crudes
- Efficiently create input files for other applications
- Use standard templates to create input files for GRTMPS, PIMS, RPMS, HYSYS, others
- Integrate Assay Management System to your LIMS
- Customize Reports and Export them anywhere
- Create Reports in Excel
- Store Results in Relational Databases for reporting and other applications
- Perform Cut point Optimization through links with Plant Models
- Synthesize Crudes from Components
- Integrate HCAMS with other applications through ActiveX capabilities.
- Share Assay information with colleagues and partners in a standard format.
- Work with your own assays or use commercial assay databases.

H/CAMS consists of three independent but related modules:

iCDM is the graphical interactive data manager. This is a database for capturing, storing and maintaining assay information. The module incorporates interactive graphical tools for editing, extending, checking and filtering crude assay information.

CAL-II predicts cut yields and qualities of single assays, blends and spiked crudes. Interfaces to spreadsheets and text files allow easy configuration of reports and input files for other applications. A number of standard templates for common applications are bundled.

Interface Modules are available to link to all commercial LP Planning and Process Simulation applications. There are several generic interface
1. iCDM (Interactive Crude Data Manager)

To support the addition of new assays to the database, Haverly developed the Interactive Crude Data Manager (iCDM). After laboratory assay data is entered into the system, users can analyze the data graphically. Properties are automatically plotted in the graphical iCDM screens, and users can smooth the data through adding points, removing points, or moving points or whole curves. Auto smoothing is also available.

Several other curve smoothing tools are available for extending limited measured data. Correlated curves and “predicted” values can also be displayed.

The laboratory data is plotted with green points, with the smoothed data points and curve shown in red. The laboratory data remains untouched, and only the smoothed data and the resultant output file are used for yield and property predictions. A full Whole crude balance check on critical properties is also determined.

Predicted cut properties for any cut range can be displayed by ActiveX calls to the CAL-II Module.

Correlated curves can be displayed and if required can replace the base curve.
2. CAL-II

The CAL-II software package can process and manage all major crude oil properties and blending characteristics. The basic system was originally developed by Chevron Research Corporation to aid their refining interests throughout North America and worldwide.

After Haverly acquired the rights to develop and market the package, we built on this robust platform, adding user friendly interfaces and modern correlation techniques for certain properties. H/CAMS modules have recently been integrated with other applications through Active-X capabilities.

The user defines the cut points for a proposed distillation, and the program will calculate the resulting weight and volume percent and properties of each cut. Physical units for output of data are under user control. The assay can be a single crude, a mixture of crudes, or a crude and another stream (such as coker naphtha recycle). With unit separation factors, CALII can evaluate the actual properties one would obtain in the refinery. Alternatively, the user can obtain pure TBP output data. The user could also define the desired volume percent and then the system would calculate the cut points. Finally, if the user were interested in producing a cut with a specific quality level, the system would calculate the cut point temperature and the volume percent to achieve that level.

CAL-II will work with your existing corporate assay database or it can be augmented with high quality assay libraries from Chevron, British Petroleum and Haverly Systems. CAL-II offers enhanced economic, strategic and operating decision support. CAL-II is easy to use and easy to connect to your planning package or other related applications.

It is possible to process any number of crude assays in a batch. For example you can re-cut all the crudes in the BP Assay database and create new LP crude files in a matter of minutes.

Predictive ability is enhanced with our proprietary separation factor methods to simulate particular crude tower distillation performance. We also provide methods to estimate separation factors based on test-run distillation data.
The Inefficiency factors can be fine tuned to match critical properties for each cut stream.

A full comprehensive output report is produced. This list of properties and descriptions can be user controlled. The report can also be converted to Excel format automatically.

3. Interface Software

HAVERLY provides interface software to transfer the data into a format usable by other systems. These other systems include:

- Connections to Lab LIMS systems
- Haverly’s G4 refinery planning system
- Other commercial planning systems
- All commercial Process Simulation Applications (eg: PRO-II)
- User configurable spreadsheet reports
- Output Database tools

Two types of database viewing tools are available. The PC based viewer allows easy comparison of crudes properties side by side.

The other viewer is a Web based and is part of the H/COMET application.

Both have excellent search routines for finding crudes based on cut property criteria.
4. H/CAMS tools

There are several ad-on tools available with the H/CAMS system. There is a unit conversion tool for converting unusual property units used in the oil industry.

Another tool called Yield Blend is used for entering product distillations. It will convert them to TBP distillations and then recombine them to full feed equivalent.

The calculations are rigorous and fully mass balanced.

The tool will also determine the TBP cut points, the 5 & 95 overlap and the rectifying and stripping indices.

It will also provide the tuning factors for the CAL-II Inefficiency method.

Another very useful tool is called the Blend Optimizer.

This is used to determine the ‘optimal’ blend composition for selected crudes that will meet certain user defined cut property specs.

Current crude prices can be entered so that the most ‘economical’ blend is determined if there is more than one answer for the optimal mix.
Flash Assay Tool (Optional)

Flash Assays are typically done at very short notice and usually only include whole crude property measurements. They often also include a simulated distillation for the description of the new crude yield pattern.

The Flash Assay Tool allows for this data to be entered into new input screens in iCDM. It requires the availability of an existing full assay data file (CRU file format) for the crude. Typically this is an older, out of date assay with the new Flash data showing a significant change in the qualities of the whole crude.

The example on the right is showing the entry of new whole crude Gravity, Sulfur and Vanadium data. The numbers have been exaggerated for example purposes only. There are input screens for entering the new Yield data either VL% or Wt%. If Simulated distillation data is entered then Wt% units should be chosen. New General information, such as assay date can be entered.

Once the new data is entered and the ‘update’ button selected the standard assay for the crude is automatically updated to give a full assay for the specific batch. The Yield curve is first updated and then all Whole Crude Balancing property curves are adjusted until they balance out to the new input Whole crude values. For the example to the left the Whole Crude gravity input is now 37 API and the calculated is 37.53 which is the balance number determined from the adjusted Gravity curve (see below). In this example new calculated Sulfur and Vanadium values have been determined. The adjusted Sulfur curve vs the original is shown below.

This capability helps keep your assay library and planning and scheduling current to the latest qualities of the crude as actually received.
Crude Assay Databases

HAVERLY is the world leader in crude assay supply and offers the widest selection of assays. Each of the libraries below are fully compatible with the H/CAMS software.

**Chevron Assay Library**
The Chevron library has over 1000 assays representing crudes from around the world. Additions to this library are made annually.

**BP Assay Library**
The BP library contains over 600 assays representing crudes from around the world. Additions to this library are done quarterly.

**HAVERLY Assay Library**
The HAVERLY library contains over 220 assays from around the world. A small number of assays are added each year.