Using VMGSim with Production Accounting: Only the Beginning

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Although Process Simulation is used almost exclusively in the oil and gas industry as an engineering function to aid design and investigate operational issues, we thought that the functionality of VMGSim would be appropriate for filling significant gaps in production accounting (PA) workflow.

We think that we were right.

At Recount, we have been using VMGSim for more than two years to support PA work. Various problems that had no obvious solutions were successfully addressed including:

- Gas and Liquids Production /Sales Balancing
  - Determining in-stream components to allocate properly to producers **(Example 1)**
  - Determining the source of a metering busts between group and inlet measurement
  - Supporting EPAP applications for mixed Test and Measurement exemption application with the EUB
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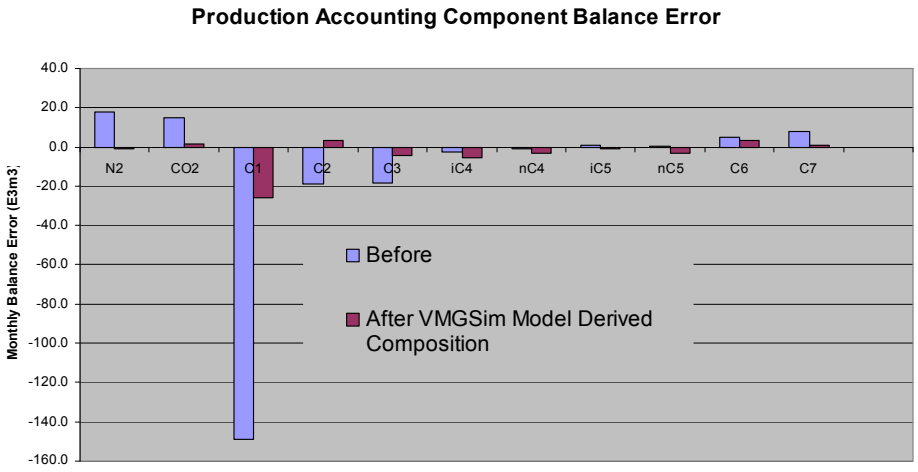
- Quantification of Liquids Contribution from Individual Producers
  - To address audit requirements - calculating the amount of over-allocation to a metering group discovered to have been measured inaccurately for a significant period.
  - Discovering that the disappearance of liquids from a refridge plant could not be due to inlet compositional changes. Liquids were restored after a process fix **(Example 2)**
  - Determining and quantifying the negative effect of very lean gas on overall liquids production to the detriment of rich gas producers **(Example 3)**
- Diluent Component Transfer
  - In a heavy oil transport process, determining the amounts of individual hydrocarbon components that remained in the oil sales stream to allow for proper accounting to diluent stream owners.

Example 1: Two plants connected to common sales stream with varying inlet rates – causing poor monthly component balances.

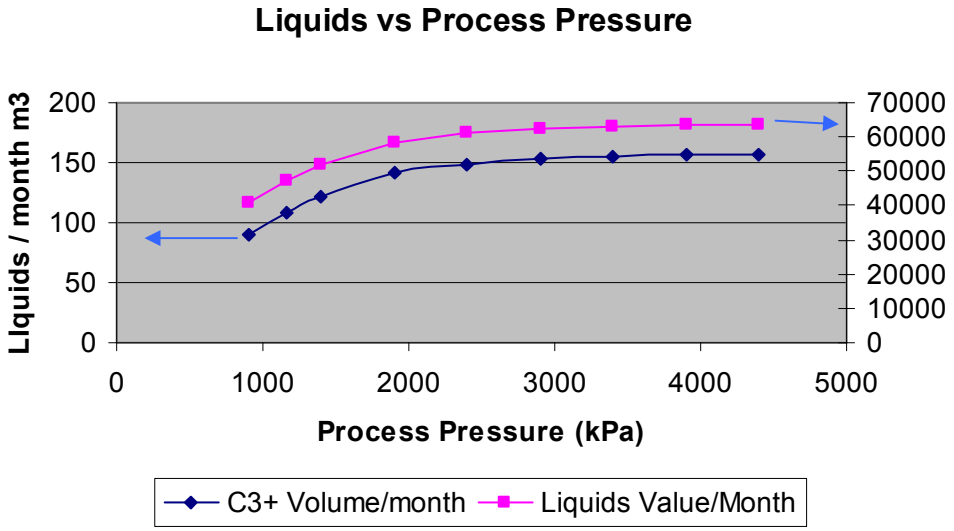
It was necessary to determine the sales stream contributed by each plant. This was not available in sufficient accuracy due to variations in inlet flow from month to month. In this example, a model of the two plants was constructed. Inlet level inputs of compositions and rates were used. In Stream Components (ISC) for each plant could not be accurately set. Because of this, Ideal Product Shrinkage (IPS) could not be determined. IPS is a comparison between theoretical components and actual components leaving the plant derived using a standard production accounting package.



With the ISC generated by the process model at a plant level determined, the IPS balance was significantly improved over previous months using VMGSim model derived plant compositional analyses.

Example 2: Disappearing liquids from refridge plant.

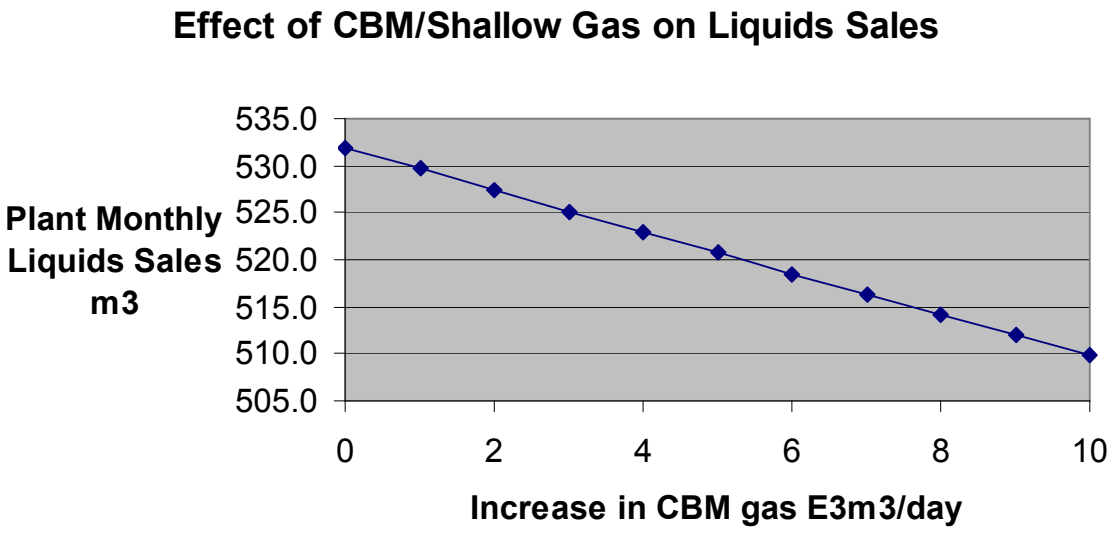
The disappearance of liquids production from a central Alberta refridge facility was investigated. The plant production of liquids had deteriorated gradually becoming zero in early 2010. As part of a more general accounting support effort, a model was built of the facility. Since the model was built, it was a straightforward matter to investigate the liquids issue using the current process stream and operating parameters. The figure below shows that at no level of process pressure (thought initially to be a possible reason for lack of liquids) should the liquids have disappeared.



When plant personnel investigated, the cause of the process deficiency was identified and corrected. This required no capital cost. The process is back to producing sales liquids to the tune of greater than $50,000 incremental revenue per month.

Example 3: Explaining the negative impact of lean gas on total plant liquids.

The figure below shows the effect on liquids sales from a VMGSim model of a currently operating refridge plant. The amount of this reduction effect is dependent upon the actual richer gas composition and the process conditions (Chiller/Low Temperature Separator Pressure and Temperature) but is real and relevant in any environment involving the mixing of CBM/Shallow gas and richer gas process streams.



In this case, each 10 E3m3/day of shallow gas reduces the liquids sales attributable to unchanging rates of solution gas wells by over 20 m3/month. While the components not being liquefied are going to the sales gas stream, the slight increase in rate and heating value of the sales gas stream due to this is minimal. The net loss in revenue due to reduced liquids can be significant.

In these situations, it is important to firstly be aware of the effect and with that knowledge, being able to explain changes in liquids output to managers or partners. It should also be considered in the economics related to fees for third party processing of lean gas.

Much more to be done:

We strongly feel that the work done is only part of the beginning of using appropriate process models to support the PA business function. The basic data requirements are no greater than that for PA work to be properly done to today's standards: up to date compositional analyses, a proper flow schematic and a sufficiently detailed process description.

The utility of VMGSim in our work has been excellent. We build models that are as complex as required by the process they describe. Once set-up for each processing facility, a process model can be used to address unique issues or as a regular monthly run.

Steady state simulations are sufficient to answer nearly all production accounting issues. Due to its robustness and user friendly interface, building models with VMGSim has been efficient and quick to run. It is straightforward to edit models and the ability to cut and paste input and output for quick answers has been welcome to provide answers to PA professionals on strict, short deadlines. Case Studies runs have increased the efficiency of the work also.

Some of the examples above are contained in a Canadian School of Hydrocarbon Measurement Paper available from the Recount website recoupresources.com. Questions about any of the above can be addressed to: lsibb@recoupresources.com or by phone at: 403-819-7174.