Virtuoso® / VMS

Virtual Metering System®

Virtuoso®/VMS (Virtual metering system®)

Wood provides robust, real-time online and offline digital tools for the efficient management of oil and gas operations. Virtuoso® is a field proven suite of software tools, with more than 20 years' successful track record of performance in the field.

Wood technology supports engineering studies, operator training and simulation of wells, pipelines and processing facility operations both onshore and offshore.

Wood's software products provide essential operational and commercial functionalities based on the unique challenges specific to each customer's project. We address the most complex single and multiphase gathering, production, transportation and processing issues with our technology solutions.

Today, Virtuoso is used to help manage some of the world's key gas resources, supporting 30% of the global LNG production. The Virtuoso software suite is offered in both offline and online packages, which are geared for Asset Performance Monitoring (APM). They provide monitoring and advisory functions and are focused on ensuring operational integrity, production operations management & optimisation, performance assessment, planning & forecasting, data analysis and visualisation.

Not all "virtual flow meters" are created equal

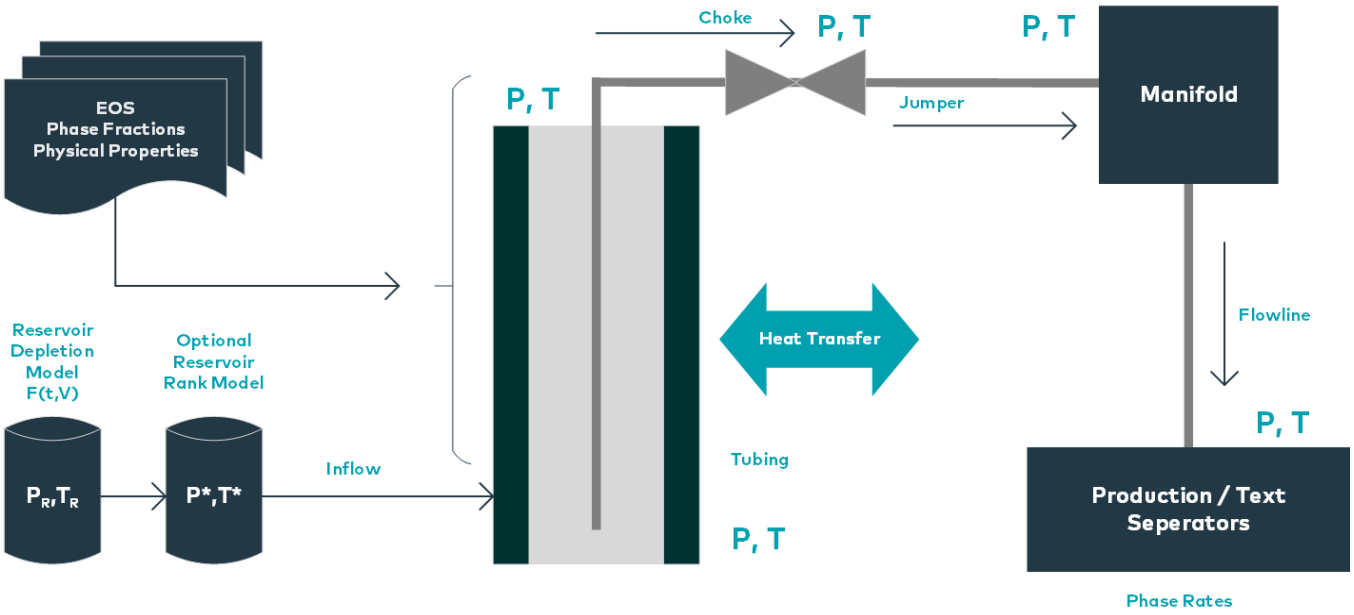
Wood's virtual metering technology has been extensively used on assets globally for more than two decades. With thousands of well-years of operational life, Virtuoso®/ VMS is mature and field proven. Our technology is extremely robust that can overcome reallife installation issues such as field instrument issues, data unavailability, communications problems, and maintainability of the system over the entire field life. It is also enhanced with Wood's Virtual Water Detection (VWDS) module to improve water detection capability even for very challenging operations.

While others may claim their recent forays into offering virtual flow metering, and others rely primarily on well chokes or simplistic methods for flowrate estimates or pure data analytics, why take the risk. Choose only the one that is field-proven and rigorous, when reliability and accuracy matters.

Virtuoso®/VMS is the real-time, on-line software solution that we offer to our global clients, for the purpose of single-phase and multiphase inferential metering applications. Utilizing commonly available conventional pressure and temperature sensors in a wellbore and around the wellhead in various combinations, it reliably predicts the multiphase flowrates of the individual wells and provides the associated uncertainty in the calculated rates in real time. It can also be used to determine the efficiency/effectiveness of the gas or water injection strategy being used, as well as EOR processes, and for continuous well surveillance.

Virtuoso/VMS provides an accurate estimate of the oil, gas, and water production rates using multiple models to determine the corresponding flowrate and then statistically uses these to determine the best estimated production rates. The use of multiple models leads to improved accuracy in the flowrate predictions as well as provides the necessary robustness and redundancy in the event of failure of any of the well's instrumentation over the course of its production life.

Virtuoso/VMS is designed for unattended operation, so the system automatically collects process data and calculates the flowrate estimates and alarm information. The calculated flowrate information can be transmitted automatically to the SCADA, DCS or process data historian system in real time. To the end user, the data from the Virtuoso/VMS is an important flowrate measurement and a means to assess how the well(s) is performing.



Virtuoso/VMS is made up of several building blocks:

- an inflow performance model,
- a transient wellbore model,
- a choke model, and
- a well jumper model.

It is important to use multiple models to estimate flowrates because model accuracies vary depending on flow regimes. Using these models, several distinct flowrates are calculated.

The use of multiple flowrate calculations lead to a more accurate overall estimate because the uncertainty of each measurement is determined and then used to combine them to get the lowest overall uncertainty. Virtuoso/VMS uses DPs in the 10 to 300 bar range vs. mbars typically used in physical meters.

A Virtuoso dynamic model of a well provides a variety of useful functionalities in an operations environment.

Well flowrate estimation

By using conventional well instrumentation coupled with inflow performance and/or multi-tank reservoir models, flowrate predictions are made based on continuous well production rates using Virtuoso/VMS. These estimated rates are used as stand-alone virtual measurements for pipeline network models or in a surveillance capacity (and insurance policy) with conventional single or multiphase metering. This well model is also be used to predict overall production performance as system back pressures in a pipeline network change with time.

Well performance surveillance

Because the well flowrate estimations are based on rigorous thermodynamics and hydraulics, VMS can infer certain well performance information in real-time. Virtuoso trend data is used to assess/confirm reservoir pressure depletion rates as well as shifts in well stream composition. In addition, it has well instrumentation surveillance functions, that flags for failing or failed instrumentation.

Virtual water detection (VWDS)

Virtuoso/VMS has a specialised module for detecting changes in water content of each well. The system advises of the presence of water in a specific well, quantifies the loading, relays the adjusted water content to the VMS and the Virtuoso pipeline models to allow tracking of the water through the production system and for improved validation against topsides metering.

VWDS offers unique features that greatly improves the overall water detection capability, better than conventional physical meters. It is applicable to both oil or gas dominated systems, with the latter particularly key as quantifying the water loading is critical to management of the inhibition requirements.

Production optimisation

Virtuoso well models also allow a number of different possibilities for optimization. Examples include: gas lift, well cycling (pressure buildup/ drawdown on older reservoirs), blending (where quality/spec is a concern or where processing limits require well mix optimization).

Improving allocation

Using historised data, the Virtuoso well models is used to improve production allocation and help better understand production dynamics and trends including near well bore dynamics, warm-up times, pressure depletion, etc. By examining production data (Ps/ Ts, well test and production data) inflow performance and pressure transients are studied and compared with reservoir engineering analysis.

We can help

At Wood, we have subject matter experts (SME) in production measurement backed by a full staff of discipline engineers to address a variety of measurement-related areas including phase behaviour modeling, flow assurance, dynamic process simulation & engineering, CFD, and process modifications & optimisation.

Wood's team has a wealth of knowledge, backed by years of experience in developing metering philosophy, production allocation systems with contingency procedures for a variety of abnormal operating modes. Wood's production measurement team provides full life cycle support from design, to start-up, and on to ongoing performance verification.

Benefits of Wood's Technology

- It provides cost-effective well performance monitoring at a fraction of the cost by using conventional field sensors
- More robust, using multiple methods than physical meters
- Field-proven as a standalone or as a backup to physical ones
- Data analytics allows improved allocation for both "virtual meters" and physical meters
- Not limited to fluid types and handles changes over field life
- Provides multizone flowrates and at as many user required "flash" conditions, and cumulatives (daily/weekly)
- Built-in data filtering ensures data reliability and provides "health check" of field instruments
- Reduces well testing and production deferral costs/risks
- Improves surveillance, advises on changes in water loading & composition

Wood. Powered by possible

The need for change has never been greater. In our industries, in the way we treat our planet, and in how we live.

To challenge the status quo we must be brave – it's having the courage to forge new answers. We're 40,000 inquisitive minds, on a quest to unlock solutions to the world's most critical challenges, across all of energy and the built environment.

United by our mission to create a sustainable future as the world evolves to a cleaner planet. Our bold spirit drives us to lead the charge, our actions transform challenges into solutions, and our curiosity keeps us pushing, innovating, making the impossible... possible.

Because we understand the time for talk is over. Because the world needs new answers to old challenges. Because at Wood, we are future ready, now.

For further information please go to:

woodplc.com @Woodplc Wood @Woodplc Wood