Most data in upstream oil and gas is wasted, and that is not a good thing.

On one hand, the need for real-time, accurate data to drive safety, efficiency and reliability has rarely been greater. Tight margins, stringent regulation, harsh operating environments, unconventional production developments and complex value chains all press for faster, better information to drive operational decisions.

This need has coincided with a massive expansion in the data available upstream: smart instruments, wireless technology, advanced sensors, improved communications infrastructure, increased storage capacity and more sophisticated control systems have resulted in an explosion of digital oilfield solutions on the optimisation of real-time data.

Michele Loseto, Honeywell, assesses the impact of digital field solutions on the optimisation of real-time data.
of data. Consequently, analysis of today’s volume of data has become a daunting task.1

As Bain & Company notes: “The rise of pervasive computing devices – affordable sensors that collect and transmit data – as well as new analytic tools and advanced bigger storage capabilities are opening more possibilities every year. Oil producers can capture more detailed data in real time at lower costs and from previously inaccessible areas, to improve oilfield and plant performance.”

However if data is poorly utilised, increasing the amount of data may do more harm than good in an industry already swamped, especially when using tag-based visualisation solutions. Estimates indicate that only 1% of data is made available to decision makers.2 Manual processes, lack of prioritisation, poor collaboration and skills shortages combined with the sheer weight of data undermines its potential value. So, overwhelming those controlling and overlooking processes with more data not only adds little benefit, but can obscure their visibility. Decisions can become weaker as a result.

Regarding data sources, enablers and use, BP notes that the ‘digital’ in the digital oilfield is a broad term: “It includes sensors, telecommunications networks, simulation and optimisation, and robotics, coupled with advanced condition monitoring and computational power, enabling major changes to working methods. The integration of all those components allows us to predictively support operation decisions in real time, based on early warnings signs of performance issues.”3 The latter highlights how a proper of use real time data can prompt smarter decisions, and a different way of working.

A proactive and agile way of work relies on effective use of real time data to keep ahead of issues, identifying their location and overcoming the limitations of solutions that can only provide daily analysis views. Analysis is important, but exception-based surveillance is vital to achieving agility.

**Divergent demands**

Implementing a digital field solution requires overcoming a number of challenges.

First is to make the case to prioritise data analysis and action over acquisition. Additional, well applied instrumentation can bring significant benefits. However, before adding more measurements, most processes would do well if they could take greater advantage of the data they already have.

Then it is important to leverage existing data and solutions, avoiding a rip and replace. This requires solutions with standard interfaces to interexchange data with other existing solutions without tying users to a sole manufacturer, ensuring scalability, lower cost of ownership and higher return on investment.

Perhaps the most significant challenge, however, comes down to the scale of data available. Not only do the volumes make it hard to identify the data needed for particular tasks; the possibilities mean there is a range of competing needs.

Different disciplines each have individual requirements. Engineers overseeing reservoirs and wells, for example, have different needs to control engineers in charge of shutdown systems; likewise, different to mechanical engineers overseeing pumps, compressors and other critical assets. Each of these disciplines has its own priorities and needs, both in terms of data required and use. A single solution will not suffice.

At the same time, the outcome of the production chain depends on the performance and efficiency of each element overlooked by different disciplines in an orchestrated manner. Excellent wells and good pipelines are little help if export pumps reliability is poor causing frequent shutdowns and deferrals.

Both specific solutions that address precise requirements of different disciplines, and a coherent approach that enables efforts to be coordinated and prioritised, are therefore required.

**Divide and conquer**

To meet the first requirement of information tailored to different users, Honeywell advocates approaching the data challenge through a range of ‘digital suites’. These effectively use data to create digital intelligence: solutions aimed at specific users and supporting the different disciplines through data collection, visualisation and KPIs to drive analysis, automation, workflow creation and reports.

Overall, these suites deliver a range of functions to support various disciplines, enabling real time situational awareness for:

- Proactive operations.
- Automatic integration of data for advanced analysis and KPIs.
- Easy access to relevant data and calculations to support analysis.
- Exception-based surveillance to promote early interventions that reduce downtime, maintenance costs and underperformance.
- Visualisations and access to data to support decision making.

To ensure this intelligence reaches those that need it, the solutions can be accessed from any computer – subject to user credentials and cyber security controls. Newer versions of solutions can also be accessed from tablets, and integrated with a novel mobile alerting app.

Specifically, the different suites address different elements and areas in the production chain. These can be broken down into six major areas:

- Operational data, providing data integration, recording and visualisation solutions. These store, safeguard and analyse data, serve it to applications and enable users to replay historical and real time data at the production and enterprise level to improve decision making.
- Process safety solutions for effective alarm management, and continuous monitoring and validation of shutdown systems and elements for safe processes, operations and shutdowns.
- Equipment effectiveness solutions for continuous condition monitoring of critical elements on the production chain, including various types of equipment, control loops and instruments. These solutions provide early indications of problems to enable prompt action that minimises maintenance costs, maximises uptime and reduces deferrals.
- Production surveillance applications for continuous production monitoring at the well, field and facility levels. Quickly spot underperforming assets/wells to ensure production targets are met, and deliver accurate production data for allocation, accounting and reporting.
- Production excellence solutions to effectively plan, optimise and manage production and operations.
- Operational performance, focused on enterprise information management and collaboration. These solutions make sense of information from operating facilities and across the enterprise, and provide better visibility into data on its proper context.

Each suite includes products that can be individually selected. The precise functionality of the solutions varies, but broadly, such solutions help gather and convert data into
actionable intelligence. They provide intelligence on the current, recent and past conditions to promote full awareness and depth of analysis. They also simplify and improve the gathering, analysis and recording of the relevant data, automating processing in most cases via smart calculations/analyses, increasing the quality, frequency and depth, replacing traditional spreadsheet based approaches that typically create data/functional silos.

Breaking it down into these different functional spaces helps to address the requirements of the whole production chain. This comprehensive set of suites addresses requirements from multiple disciplines, and where there are overlaps, the information is shown in the most useful way for the specific user.

Moreover, segregating the solutions by areas provides the flexibility to address specific requirements and to prioritise elements according to customer’s needs. Organisations can focus on those areas where the need and potential returns on investment is greatest, helping control costs and secure incremental improvements. This avoids a big-bang implementation, and enables a gradual and scalable one.

**Process safety: never waste a unplanned shutdown**

Process safety is typically a key area in any organisation since the need to protect people, facilities and environment is critical. This also serves as a good illustration of the benefits what a digital solution can provide making a better use of real time data.

Overall, the industry has made significant investments to improve process safety through detection and shutdown systems. Even in this area, though, much of the available data is still wasted.

On one hand, there are well-documented gains to be achieved through alarm management software, both in terms of safety but also on operational efficiency. This can use both real time data from field devices, as well as models for model-based alarming and alerts.

However, there is another type of data from safety and shutdown systems usually overlooked: the sequence of events. This includes alarms, commands and responses, among others events coming from control and shutdown systems. For example a command to close a valve as part of a shutdown, if successful, should generate a response signal confirming the intended action.

If not already done, this sequence of events can be captured to provide a useful data trail on the operation of shutdown systems and safety elements that can be used to continuously analyse and track their condition and operation.

The importance of this sequence of events for validating final elements like safety valves is well recognised. Valves failing to respond or not doing so in a timely manner could jeopardise the reliability of the safety system and the process safety. Also keeping track of lost successful valve operations is useful to identify valves needing testing, if not successfully detecting that in a period. This data is therefore valuable.

Sequence of events is also useful for validating shutdown systems, including initiators and the timely occurrence of expected effects as per nominal shutdown systems behaviour. The latter relies on the condition of systems, elements, and the way they are operated or miss-operated via overrides.

However, shutdown systems validation is typically done periodically once a year; a major shutdown is planned, data collected and analysed manually using spreadsheets. This method is both time-consuming and, in as much as it is a manual process, prone to error. This also means the data from unplanned shutdowns and safety operations is not used, and thus is wasted.

Automating the capture and analysis of events brings a number of benefits. First, as an automated process, it is more accurate and significantly more efficient than traditional methods. It also provides continuous monitoring. Rather than waiting for an annual appraisal of the shutdown system, any shutdown and operation – planned or unplanned – serves as a validation of system’s performance.

This reduces downtime in two ways. First, it can eliminate or shorten planned shutdowns for testing, since unplanned shutdowns and operations could serve the purpose. Second, because problems that would usually only be identified during the annual validation are detected and addressed more quickly on the go pro-actively, the reliability and safety of the system is ensured on the go. Moreover, storage and supporting data and reports is automated; this information can be used for compliance purposes with regulators – improving the efficiency of this task – or to demonstrate continuous, systematic monitoring to insurers, potentially resulting in lower premiums.

**Cost benefit**

Similarly, significant improvements from the use of digital field solutions creating digital intelligence can be seen across multiple functions, bringing improvements in safety, reliability, efficiency and performance.

Benefits of digital field solutions include increased production, reduced Opex and improved HSE. Exception based surveillance can save up to 60% surveillance time and improve decision cycle time. Estimates indicate that the effective use of real time data can account for a net production increase of 4 - 6%. On unconventional fields with numerous wells geographically spread, exception based well surveillance has shown savings of US$200 000 – 300 000 per well per event preventing equipment damage, costly work overs and deferrals. The combined impact of a holistic approach is substantial.

Despite this, the scale of the digital field challenge requires a scalable approach to implementation. This not only enables operators to plan and control their costs; it can ensure an orderly approach that correctly prioritises work. This enables operations to move to a more informed process more quickly and ensures that the operation truly makes the most use of its data, transforming and improving the way the work processes take place.

There is no ‘one size fits all’ solution, but a comprehensive portfolio of products, such as those provided by Honeywell, can adapt to customers’ needs, scope, and pace. The data and opportunity to use it effectively is there, which is definitely a good thing.

**References**