In the US, today’s oil and gas pipeline capacity is far short of what is needed in the future, according to the American Petroleum Institute. Given all the expected growth of oil, natural gas and natural gas liquids production in coming years, it forecasts that, by 2035, as much as 45 000 miles of transmission and distribution pipelines with 10 - 12 million hp of compression must be replaced or added to existing capacity. Additionally, between 218 000 - 240 000 miles of gathering lines will be needed to reach upstream production sources and carry their outputs to larger transmission points. These new pipelines will take years, and massive capital outlays, to move from their initial digital drawings through construction into commissioning and full operation. That is why midstream operators need ways to simplify and streamline bringing new transmission capacity online while reducing construction time, costs, and risks. Subsequently, once those new assets are in production, operators must then maximise their utilisation yet minimise total cost of ownership over lifecycles lasting decades. Those are the only ways they can optimise the returns on such enormous investments.

Robert Skiebe, Siemens Oil & Gas, USA, considers how a cloud-based, lifecycle management model with a mobile app can track and preserve pump station assets.
To help the midstream industry achieve these goals, Siemens developed its Pipelines 4.0 approach to providing fully integrated, pre-tested, ready-to-install pumping/compressor solutions. These turnkey packages combine equipment and associated peripherals for pumping and compressor stations with data analytics, lifecycle management services, and cyber security. They also remove the complexity from multivendor procurement processes, dramatically reducing project costs, effort, time, and risks.

**Challenge: keep more than 1000 stored pipeline pump station assets operationally ready**

These solutions too can be tailored to specific customer requirements. Such was the case of a Pipelines 4.0 asset tracking and preservation platform that Siemens created for TransCanada Corporation (TransCanada). Siemens deployed a lifecycle management model that used cloud and mobile technologies to help ensure the viability and operational readiness of more than 1000 complex pump station assets.

Residing in multiple, geographically dispersed regions in North America, TransCanada’s equipment included more than 150 large, medium voltage 6500 hp motors, plus pumps and a wide range of accessories – such as variable frequency drives, power converters, switchgear, breakers, and e-shelters. The components were still under multiyear warranties of different ages and needed regular maintenance until TransCanada decided to deploy them.

But tracking and preserving these assets was complicated due to the fact that, in addition to Siemens, the project involved two other major suppliers to TransCanada. This meant that all maintenance activities, plus their associated information workflows and record keeping, had to be routed through the inner workings of four separate enterprises, all large organisations.

Also, the solution’s operating requirements became further complicated: not only was physical maintenance needed for each piece of equipment that was located across North America, but the maintenance data also had to be manageable, auditable at any time and easily accessible yet secure for all parties.

The scale of managing the initial and ongoing documentation — including maintenance schedules, work orders, repairs, and inspections — plus the maintenance of such large complex equipment, was immense.

**Solution: cloud-based, data-driven workflows, accessible via mobile devices**

Working with TransCanada, Siemens developed a set of requirements for a cloud-based, cyber secure workflow and information management platform to meet the needs of all participants. In short, the asset tracking and maintenance solution had to be flexible, fast, easy to deploy and use; able to run on different mobile operating systems and devices; and capable of scaling if necessary in the future.

After evaluating many potential technology options, Siemens chose a data collection and asset-management platform provided by Nektar Data Systems. The solution — today called Siemens Asset Clarity powered by Nektar — features a master database residing in a secure cloud environment and a downloadable mobile client application for service technicians to use. The solution offered the following features and capabilities:

- Tracking and tracing.
- Real-time reporting and visibility.
- Specific geocoding capabilities.
- Automated workflows.
- Remote, mobile access.
- Encrypted security.
- Web reporting console.
- Fast, easy report generation.

During the system design and configuration phase, service technicians were dispatched to each asset, ascertaining its identity in the project database and labelling it with a rugged, steel tag embossed with a Quick Response (QR) code as its unique identifier. They also downloaded the mobile client...
application to their preferred iOS or Android devices, whether those were smartphones or tablets.

**How it works: fully automated, wireless workflows**

Aside from a required round of minimal commissioning optimisation, the Siemens Asset Clarity tracking and preservation solution has worked flawlessly since its debut. Today, all workflows are electronic and automated. Each time technicians make a service call on a piece of equipment, they scan the QR code on the asset’s tag and complete check boxes on a form in the app using their phone or tablet.

The mobile app sends the data wirelessly and securely to the cloud, where it enters the master database. There, it updates the asset’s record with whatever preservation maintenance work was performed. The record shows the asset’s location and all completed and pending tasks. If necessary, technicians can upload photos to document equipment condition.

The solution facilitates the ordering of parts, which can save lots of time and potential errors. Should a part need replacing, for example, a technician can take several photos of it, select the part number from a drop-down menu in the mobile app, then click on record.

This step instantly sends a secure parts order with all key information, including the part’s pictures, to all the appropriate people. These include those people who must pull the part from inventory, package and ship it, as well as those who just need to be informed — such as the shipping agents and finance. The automated workflow eliminates the potential for confusion and communication errors. The correct parts are ordered the first time, without the back and forth delays and costs of the wrong parts being pulled and shipped.

Furthermore, when the part is shipped, the Siemens solution generates a work order for the part’s installation, scheduling a service technician through the mobile app to coincide with the arrival of the part. This type of co-ordination cuts out the all-too-common and costly problem in manual dispatch systems of technicians showing up onsite but lacking the parts to complete the service call. Also, an electronic invoice for the part is issued too, which saves time and effort, while also improving the vendor’s cash flow.

The Siemens Pipelines 4.0 asset tracking and preservation solution provides a web-based console that displays comprehensive, real-time views of all current activities and work histories relating to the managed assets — whether in aggregate or by serial number, location, category, warranty expiration, or several other parameters. Any factory recalls or service bulletins issued for a particular component can be immediately correlated with that component. If asset documents are needed, they can be easily retrieved from cloud storage, viewed and printed, if necessary.

**Results: dramatic savings, plus greater visibility, insights and other benefits**

The Siemens Asset Clarity tracking and preservation solution has helped TransCanada avoid significant costs. One of the largest sources of this cost avoidance was the consolidation and optimisation of asset storage, saving tens of thousands of dollars a month in warehouse space rental. Another source has been hundreds of thousands of dollars in cost avoidance associated with radical reductions, if not total elimination, of workflow paperwork. Payroll savings have also added up because no analyst time is required to produce project status reports. Instead, up-to-the-minute data is always available with just a few clicks of a mouse or touches to an authorised user’s smartphone or tablet.

Other benefits have included:

- **Accelerated workflows** – no longer do documents need to be sent from one sign-off authority to another. With a mouse click and an electronic signature, they are processed instantly, unlike the previous paper-based print-scan-and-transfer methods.

- **Improved responsiveness and skills utilisation** – responsiveness of all project participants is streamlined
because the automated system eliminates the cycle times and latencies associated with manual record keeping systems or patchwork automated workflows. In the past, maintenance personnel had excessive time tied up in paperwork and documentation, which led to less time to perform those high priority tasks that required their training and experience.

- Greater visibility, reporting, and insights – project management can instantly have current status and historical views of all 1000 and more assets at any time and from anywhere, via the solution’s web reporting console. They can then segment the data in whatever way suits their needs at the time. Colour-coded, graphic alerts can flag deviations from expected KPIs. This can help draw insights into areas needing attention and improvement to help optimise asset management and preservation (Figure 3).

- Faster technology adoption – having service technicians able to download the solution’s mobile app to their phones or tablets and start working right away, not only saved time but also enabled all participants to focus on the highest priority tasks first. This ultimately reduced time to breakeven and resulted in a faster return on investment (ROI).

- Asset value retention – with complete traceability from the latest inspection task all the way back to the asset’s manufactured date, any potential buyer can see, with detailed precision and timeliness, all warranty work through the asset’s entire lifecycle. This helps increase and retain the asset’s value.

**Future ready: expanding lifecycle management with asset tracking and preservation**

Given this successful deployment with TransCanada, Siemens is investigating how to apply the asset tracking and preservation solution in other projects, and also how to apply it earlier in an asset’s lifecycle, even as early as its design stage.

One application of the Siemens Asset Clarity solution, for example, could enable customers to document every custody transfer point for an asset. Pictures can be taken and the asset geotagged with GPS co-ordinates to provide another layer of transparency in asset handling and transfer.

The solution can also interface with enterprise resource planning (ERP) systems and other client-specific tools to facilitate even more applications of paperless asset management. This can allow highly skilled personnel, such as technicians and business analysts, to focus on more value-adding tasks, instead of chasing and handling paper.

Also, Siemens plans to expand the Clarity tool to include management of drawings, documents, visualisations, and simulations that would include virtual and augmented reality, plus physical capabilities – such as hydrocarbon leak detection. In a separate project, Siemens has deployed Clarity for the complete lifecycle data management of operational, maintenance, and repair events and activities.

**References**