

# NOVOS and wired drill pipe

## Enable drilling automation on Alaska North Slope

### Challenge

The operator was drilling a series of difficult two-section sidetrack wells on the Alaska North Slope that served as production replacement wells. Significant environmental and operational hurdles, including subzero temperatures, flora and fauna sensitivity, and fragile geologic conditions, made these some of the most technically challenging wells drilled in the region. Our process automation achieved 95% uptime with wired drill pipe and improved overall drilling performance on project wells versus offsets.

### Solution

There were two major components that enabled drilling automation on this project. The first was the NOVOS™ reflexive drilling system, a platform for process automation. NOVOS sits on top of the rig's base-level control system and uses an imported well plan that describes desired drilling parameter ranges, performing planned operations until TD is reached. This level of control and consistency naturally leads to improved drilling performance throughout the drilling lifecycle, regardless of driller experience levels. NOVOS also structures data and defines activities, helping engineers to develop lessons learned and scale best practices across fleets and regions.

The second was IntelliServ™ wired drill pipe. Wired drill pipe incorporates a coaxial cable along the length of the drillstring from the rig sensors near the drill bit. The wired pipe's associated high-speed telemetry network uses inductive coils located in the drillstring connections to enable bidirectional data transmission between surface and downhole tools at up to 57,000 bits per second.

Having both technologies enabled apps integrated into NOVOS to translate downhole drilling dynamics data into optimized, automated processes performed by the top drive and drawworks.

### Results

On this project, automation was prevalent except for pipe-handling while in slips (i.e., torquing and untorquing connections), tripping, and BHA makeup and breakdown. NOVOS helped the operator save approximately 4 minutes per intermediate hole-section connection and 2 minutes per production hole-section connection when compared with relevant offsets, and total drilling connection time (weight-to-weight) was reduced by an average of 30% versus non-automated connections on the project. NOVOS system uptime exceeded the KPI of 95% set by the operator. Wired

### Case study facts

Location: Alaska North Slope

Rig or customer: Confidential

### Time frame

- 2017 to 2018
- Total of 11 wells drilled

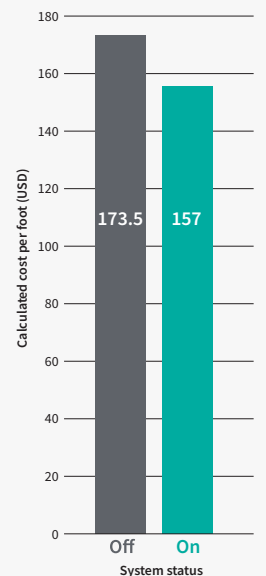
### Value to the customers

- Successful implementation of NOVOS system changes the role of the driller, allows them to focus on supervising teams while improving connection times and consistency
  - Saves 4 minutes per intermediate hole-section connection and 2 minutes per production hole-section when compared with relevant offsets
  - Saves 30% on total weight-to-weight drilling connection times
- Drilling apps are integrated into NOVOS to tailor operation of the top drive and drawworks while on bottom and improve drilling performance
- NOVOS works in harmony with wired drill pipe, allowing instantaneous data transmission from downhole dynamics tools that enables parameter optimization
- Achieve wired drill pipe uptime of greater than 99%, exceeding operator's expectations

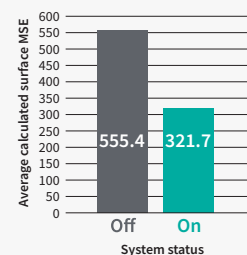
ROP with system on/off



Cost per foot with system on/off



MSE with system on/off

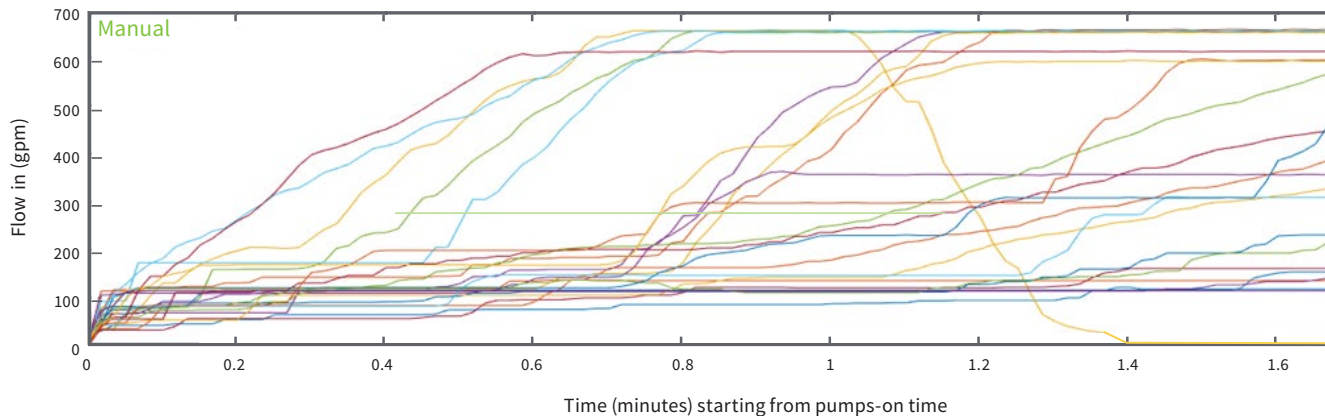
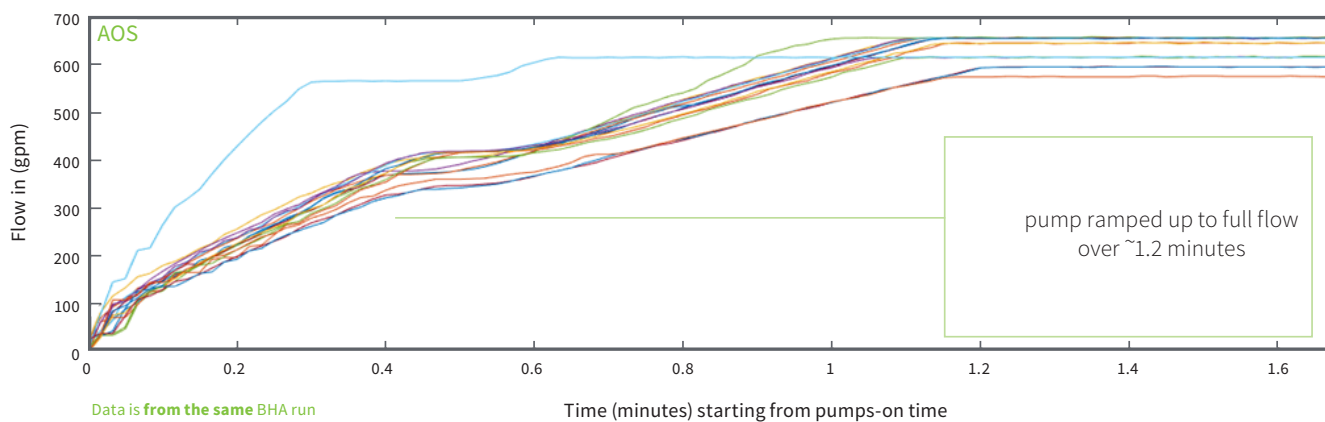


## Case Study

drill pipe saved time on both surveys and downlinks, including the effective elimination of all flat time and invisible lost time related to downlinking. System uptime exceeded the KPI set by the operator, achieving more than 99% uptime across more than 48,000 ft drilled and 800 hours of on- and off-bottom drilling time.

The drilling apps integrated into NOVOS and informed by high-speed downhole dynamics data enabled the operator to make several notable performance improvements. SoftSpeed™ II, a stick/slip prevention application, reduced or eliminated torsional vibration from manifesting and affecting

the drillstring. The dual-parameter and DWOB autodrillers consistently reduced MSE versus offsets, increased ROP, and reduced CPF (cost per foot) when in formations that weren't performance limited by ECD (equivalent fluid density) or formation concerns. An EFD viewer provided greater visibility than traditional MWD placements, helping the operator assess hole cleaning in real time and mitigate the impact of a stuck-pipe event. In addition, the EFD viewer allowed rig crews and drilling engineering teams to more quickly and reliably identify and respond to wellbore breathing events.



In addition to the time savings delivered by the automation operation system, the consistency of each step in the process is compared above, in this case the pump start-up rate. This data is taken from the same BHA run where the plan was to alternate between the system and the driller to execute the sequence, of which the pump start-up is a component. In a well with a narrow margin for initiation of losses, the ability to manage the pump start-up as illustrated above could prevent a major non-production time event.