

CASE STUDY | ENERGY

How Kelvin combined human experience and AI to deliver autonomous well optimization and control for Santos

SmartPCP™ Application boosts production and lowers costs



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‘Codifying’ engineering expertise through discipline-led data-driven modeling to provide smarter, simpler, ways of operating
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Santos

Customer

Santos Ltd

Products

Kelvin Platform + SmartPCP™ App

Organisation Size

Public Company (3,500+ employees)

Starting in 2022, Kelvin and Santos explored how to use smart software applications to optimise assets. Kelvin SmartApps combined the domain expertise of a leading production engineer with the enhanced pattern matching capabilities of AI. Once this original SmartApp was developed, Santos successfully deployed this solution to autonomously manage well production. The resulting impact has been increased efficiencies through control decisions that are based on what Santos’s best production engineer would do on their best day.

Kelvin’s software platform is now being used to manage more than 1000 wells to ensure well optimisation. Santos is now seeing:

- **95%** reduction in time spent on manual tasks
- **1%** increased production at scale
- **2%** reduction in energy consumption
- Enhanced safety by reducing the number of trips to wellsites
- Reduced onsite equipment failures through pump off reduction

Overview

Global energy company Santos Ltd is enhancing its internal engineering expertise with artificial intelligence software to move towards its goal of autonomous operations. Through its partnership with Kelvin, Santos is now optimising its upstream production gas assets with AI-enabled smart applications.

Santos and Kelvin began collaborating back in 2019. Since then, they have worked together with emerging technologies to deliver improved operating efficiency and increased production across Santos’ upstream production systems.

Challenge

Improve overall asset management in a complex and growing system

Santos operates a growing fleet of Coal Seam Gas wells in its Gladstone LNG Roma asset.

The high volume and growing complexity of wellsites created new operational challenges for Santos. Traditional methods of controlling and monitoring wellsites were reaching their limits in terms of efficiency and sustainability.

As Santos grew its number of assets, there was a real shortage of engineering time to optimize these assets. Production Engineers were each trying to maintain and optimise a growing fleet of wells to meet production goals. Given the large number of wells, only the top 5% to 10% of wells were being assessed for optimisation on a regular basis.

Along with a shortage of engineering time, there was also a challenge to balance objectives including: improving productivity, achieving profitability, maintaining safety, and reducing emissions to contribute to net zero goals.

Solution

SmartPCP™

Kelvin and SIG Machine Learning delivered SmartPCP™ – a software application optimised for CSG operations. SmartPCP™ translates vast volumes of data into actionable insights and automated responses.

SmartPCP™ is a tailored solution for Progressive Cavity Pump (PCP) systems. Kelvin makes it possible to integrate with Santos' existing control systems and successfully scale SmartPCP™ across production operations. Kelvin's software system is engineered to be self-regulating and self-learning over time, continually honing its capability to drive operational excellence. The SmartPCP™ application is able to help achieve the operational objectives of Santos, without requiring more engineering time.

Summary at a Glance

→ **95%** reduction in time spent on manual tasks

→ **1%** increase in production

→ **2%** reduction in energy usage

→ **Enhanced safety by reducing the number of trips to wellsites**

Reduced onsite equipment failures through pump off reduction



Impact

Production up, costs down

Using Kelvin has eliminated the challenges of managing a high number of wells each day as a 24-hour operation.

- **Reduced costs** by automating routine tasks, reducing human error and cutting down on operational costs.
 - ✓ **98%** accuracy from SmartPCP™ recommendations
 - ✓ **95%** reduction in time spent on manual tasks
- **Improved efficiencies** by streamlining workflows, enabling well-informed decisions to be made quicker.
 - ✓ **70%** time saving for engineers involved in surveillance and optimisation of well fields, allowing a switch from manual monitoring to strategic tasks
- **Optimised production** through the use of advanced analytics to automate optimisation decisions to maximise output.
 - ✓ **1%** increased production. Coordinated wellsites operations are delivering better production performance
- **Reduced emissions** through ensuring assets operate more efficiently, reducing workovers and the fugitive emissions that result from them.
 - ✓ **2%** reduction in energy consumption across numerous wellsites
- **Enhanced safety** by minimising the need for human intervention in hazardous areas.



Keys to Success

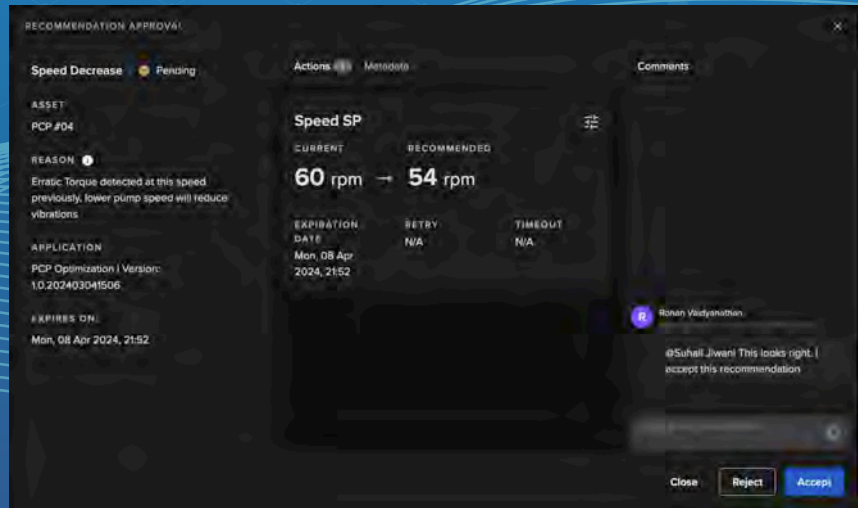
Start small, build trust, prove value and then rapidly scale

Autonomous well management was introduced gradually, with every optimisation control change presented initially as a recommendation to be approved or rejected by engineers.

When trust in the system was established, production moved from “human-in-the-loop” recommendations to automated actions through closed-loop control.

Kelvin production engineer tools made it possible to automate app workflows to optimise every well, instead of only a handful of wells.

The SIG Machine Learning model enabled optimisation of CSG wells based on their individual characteristics while contributing to overall field production increase and reduced emissions.



Santos commenced an initial pilot on 20 wells with the Kelvin system connected to real-time streaming well data.

Within weeks, an additional 65 wells had been deployed that further validated the applicability, accuracy and results.

Based on the initial pilot success, Santos moved forward rapidly to scale to standardise “the best engineer on their best day” production optimisation strategies across over 500 wells. This roll-out further validated Kelvin’s capability to convert recommendations into automated control decisions by “closing-the-loop” back to the Santos control network.

Conclusion

Santos Autonomous Operations

Santos is continuing to make strong progress on its path to autonomous operations. By working with Kelvin to deliver SmartApps that optimize assets, Santos can continue to balance the objectives of: improving productivity, achieving profitability, maintaining safety, and reducing emissions as its assets grow.

Based on this success, Kelvin and Santos are continuing to collaborate on new ways to use SmartApps to optimize assets across production operations.