

Never waste another drop: Digital twin combined with innovative whisky cask filling solution set to save millions

Kigtek, Siemens and Diageo

Background

Scotland's whisky industry is reportedly worth £5.5 billion a year. Facing challenges with the traditional whisky cask filling process an Innovate UK funded collaborative research and development project was set up to improve it using modern digital manufacturing techniques.

Industry challenge

Cask production accounts for 10% to 20% of the overall cost of whisky production, and with a minimum of three years required for Scotch whisky maturation, consistent and precise fill levels are extremely important for distillers.

Key to the project was achieving a repeatable 99% cask fill, in optimum time (typically 45 seconds per 200 litre cask) without spillage, including overflow, underfill, and foaming. This was particularly challenging because traditional Scotch whisky casks are handmade using oak, meaning variation in the volume that each can accommodate.

How did NMIS help?

Project partners, the AFRC, Siemens, Diageo and Kigtek, worked together to create an industry demonstrator, complete with whisky cask filling test rig and cyber-physical system, incorporating a digital twin.

The consortium designed, manufactured and tested an open-loop system that allows complete control of the filling process through a new advanced filling lance design. The design incorporates level measurement, providing real-time data on fill volume, allowing operators to account for every drop that has gone into each cask. It also reduces foaming and enhances the stability of the filling process.

This improved physical system benefits from a digital twin, which is a virtual representation of activity on the test rig. It provides live data based on set operating conditions, shown on the rig's control system.

The completely connected cyber-physical system factors in unexpected changes to the cask filling process, such as stoppages and overflow and reacts accordingly. Virtual and augmented reality systems will allow staff, both onsite and offsite, to visualise, understand and react to key system data.

Business impact

Testing demonstrates a consistent 99% fill volume across multiple cask sizes, highlighting the efficiency and repeatability of the improved whisky cask filling solution. It will allow the whisky industry to realise a 5% improvement in spirit volume filled into casks, potentially worth millions of pounds each year.

The innovative design and digital approaches taken on this project will provide expected improvements including:

- Reduced losses attributed to cask overflow
- Reduced storage requirements
- Improved health and safety
- Maintenance or improvement of cask fill cycle times
- A high degree of repeatability
- Enhanced environmental impact due to reduced waste

Advanced Forming Research Centre
85 Inchinnan Drive
Inchinnan
Renfrewshire PA4 9LJ

t: +44 (0)141 534 5200
e: info@afrc.org.uk
afrc.org.uk
@AFRCStrathclyde

