



World's first 3D-printed  
waterbushing deployed by  
TotalEnergies and Vallourec

# SUCCESS STORY VALLOUREC

## Overview

The first ever pressure-containing component to be produced using Wire Arc Additive Manufacturing technology (WAAM) was successfully deployed on TotalEnergies' EIG well in the Elgin-Franklin field in the North Sea. The waterbushing, designed by Vallourec, is 1.2 meters high and weighs 220kg. Waterbushings are a safety-critical component used in the oil and gas drilling industry to counter hydrocarbon kicks from wells in construction. Their strength and reliability are paramount as failure can result in equipment destruction.

## Challenge - Long lead times and standard sizes

Waterbushings pose several challenges for O&G companies. Traditionally, waterbushings are made from forged bar machined down to the desired dimensions. They must therefore conform to the specific sizes and shapes of the drill pipes and casings used and are usually rented for the duration of rig construction. This often creates issues of availability – since there are a relatively small number of waterbushings in circulation

– and safety – as the company renting them has no idea of the part's history.

Currently, suitable waterbushings aren't always available for rent, which means that operators must have them manufactured. This means longer delivery times and if a project is cancelled or the timeline changes, operators end up with unneeded equipment sitting in a warehouse.

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*"It was essential for us to have the right partner and a good business case for this project. Vallourec, as a longstanding partner, provided us with that confidence."*

**Edwige Ravry**  
Additive Manufacturing (3D Printing)  
Lead at TotalEnergies

## Solution - A 3D-printed waterbushing designed by Vallourec

For TotalEnergies, collaboration with an experienced partner such as Vallourec was key to creating an Additive Manufactured waterbushing suitable for use on the high-pressure/high-temperature (HP/HT) EIG well. TotalEnergies and Vallourec worked together to deliver the project in just over a year using Wire Arc Additive Manufacturing (WAAM), rigorously testing the product before field deployment in February 2021. WAAM is an additive manufacturing technology that uses a welding source and a robot arm to direct a printing nozzle to deposit material, layer upon layer, in near-net shapes.

The project came out of an open innovation collaboration with RAMLAB, a Rotterdam-based startup with whom the specific printing tool trajectories were developed. The aim of this project was to go beyond Proof of Concept to successfully develop the Quality Assurance and Quality Control frame of

supply for components using WAAM technology.

The manufacturing process developed leverages Vallourec's decades-long expertise in welding, metallurgy and non-destructive examination together with its recognized strengths in threading, surface treatment and pressure testing to enable manufacturing of components to customers' exact specifications.

The TotalEnergies-Vallourec waterbushing was subjected to over 150 tests and was the object of a rigorous qualification process. Tests performed ranged from ultrasonic tests to visual inspections, heat treatment procedures and pressure tests. Given the revolutionary nature of its production process, Vallourec and TotalEnergies chose to go above and beyond industry standard non-destructive tests for this component.

## Benefits/ Results - An overall better-performing component

Additive manufacturing presents numerous advantages in terms of supply chain agility and lead time efficiency. The method also offers freedom of shape and results in much lighter parts: at 220kg, the waterbushing is around half the weight of components manufactured using standard technologies.

This successful printing of the world's first safety-critical component offers numerous benefits for the oil and gas industry, one of the most important being shorter, guaranteed lead times, which would make a huge difference to end users. Additive Manufacturing also allows for greater freedom of shape – parts can

be created to the exact size and specifications of each customer – as well as for printing of very large components. The ultimate benefit of this process is to allow companies to create a digital or virtual warehouse through which they can order spare parts as a printable file. Importantly, additive manufacturing also reduces the carbon footprint of parts produced, enabling both companies to make progress against their sustainability objectives. In this instance, the waterbushing generated 45% less emissions than those created through the regular forged and machining process.

### FIND OUT MORE

To find out more about TotalEnergies' and Vallourec's 3D-printed waterbushing visit our [website](#) and its [dedicated page](#) on Additive Manufacturing.

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