

RFID Work-in-Progress Control



Vaillant Group's advanced approach to production line management

Vaillant Group is one of the world's leading manufacturers of heating, ventilation and air-conditioning technology. The company, based in Remscheid, Germany, develops and manufactures products across a product portfolio ranging from efficient heating appliances based on customary fuels to system solutions for using regenerative energy sources.

At Vaillant Group's manufacturing plant in Belper, Derbyshire, UK, domestic & industrial boilers are manufactured for the UK and Netherlands. Managing work in progress is an important issue for Vaillant Group, helping them to control costs and ensure product quality. They chose an approach using UHF radio frequency identification (RFID) and worked with CoreRFID to make their automated production management system a reality.



Vaillant Group boiler manufacturing station. The white square in the centre is the RFID reader antenna.

A World Class Manufacturer

Vaillant Group has a 135 year pedigree in heating, ventilation and air conditioning systems. From their first patent in 1894 (for a closed system boiler for heating water) to their recent innovations with fuel cell and heat pump technologies, Vaillant Group is now Europe's number one heating technology manufacturer with sales of over €2.4 billion, employing over 13,000 people in eight countries.

Vaillant Group's manufacturing in the UK concentrates on high efficiency domestic boilers. The Belper plant has a track record in achieving significant increases in production volume and manufacturing efficiency.

Boiler production at Belper depends on a one-man-build approach, with assembly staff moving the boiler chassis on a trolley through a 15 stage manufacturing process. The operations conducted at each stage depend on the required final specification of the boiler. Monitoring work in progress so that each boiler chassis follows every step in the right order is necessary to maintain product quality. Making best use of the production lines is vital for keeping manufacturing costs down.

The Vaillant Group approach to manufacturing control uses RFID to monitor the movement of boilers through the assembly process and to trigger guidance to operators on which manufacturing step was needed next. With RFID they know exactly which stage a particular boiler is at. By automatically detecting the arrival of a chassis at a manufacturing stage the Vaillant Group system can power up the tools at the station only as they are required for use. This makes sure that each manufacturing and test stage is followed in the correct sequence (a chassis at the wrong stage doesn't allow the power tools to be used). If a chassis is removed from the production flow (because of non-availability of parts for example), then the chassis can be automatically returned to the correct production stage when parts became available. It also saves energy costs during manufacture, helping to contribute to a reduced carbon footprint for Vaillant Group's manufacturing operations, just as it works to improve the green credentials of its products when in use.



“RFID is making an important contribution to error reduction and increased efficiency, CoreRFID has been instrumental in helping us select and implement the right technology.”

Richard Sainsbury, Industrial Engineering Manager, Vaillant Group

Production Flow

Vaillant Group faced many hurdles in selecting the most appropriate technology, sourcing the best components and then integrating the solution with their manufacturing control system. The Belper production facility uses four lines each with eighteen stages (“T-posts”). Each T-Post has two stations that allow the line to function as a single or twin track line. The boiler chassis is moved on a trolley along the line by the engineer responsible for the boiler’s assembly. Each boiler is taken through all stages by one assembler, carrying out their tasks at each stage, using the tools and materials available at each station. At each stage the necessary tools and components needed for the manufacturing step are available. The tools are controlled by the Vaillant Group AMS production flow management software system.



Battery assisted passive RFID tag on a boiler assembly trolley.

The four production lines (soon to be five) are laid out as a series of J-shaped tracks, moving the chassis through to a fully assembled boiler which is then tested, and sent to wrapping and dispatch. The monitoring system uses RFID tags on the trolleys to identify which boiler is at which station at which stage and RFID readers that link back to the AMS system. It copes with the problem that a trolley could switch tracks at a station in order to overtake another that is moving more slowly along the line. Creating the system presented some problems. Firstly with so many potential RFID read points in a relatively confined space (some were as little as 2.5m apart) there was a risk of signals from

a tag at one station could be picked up at another station. Secondly, because Vaillant Group wanted the trolley to trigger the tool power, the system needed to respond quickly as the trolley was brought to the station.

Vaillant Group used CoreRFID’s RFID consulting services to select the technology that would solve the problems. CoreRFID also advised Vaillant Group on aspects of the software implementation that would allow the system to achieve its design objectives. First of all CoreRFID advised the use of battery assisted passive tags (from PowerID) for the trolleys rather than conventional UHF tags. These provided quicker response times. Because of the limited number of trolleys involved (around 150) the cost of the slightly more expensive tags was less important than the very quick response of the tags as they enter the reading range of the station. Secondly CoreRFID proposed the use of ThingMagic Astra readers which, with their dual antenna capability, could handle the two stations at each manufacturing stage with a single reader. CoreRFID was able to provide guidance on the expected performance of the readers, antennas, and tags in the specific environment of the Vaillant Group factory. CoreRFID provided advice on the read field of the readers under different attenuations and also helped Vaillant Group to make use of the channel hopping facility within the ETSI frequency bands of the UHF tags. Channel hopping in the readers helped to improve the way in which the readers recognised tags and avoided the problem of a reader at one station picking up details of a tagged trolley at another station.

The Benefits

Vaillant Group’s RFID based line monitoring control system provides:

- Automatic work-in-progress detection, identifying trolleys at each production stage and station.
- Control of manufacturing steps for individually customised products.
- Automated initiation of tool power as production pieces arrive.
- Control of the sequence of production ensuring steps are followed in the correct order .
- Enabling the use of track switching to speed production.

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