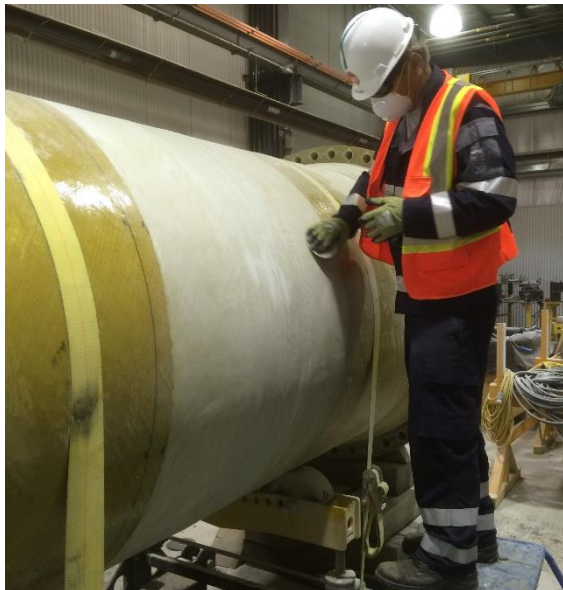


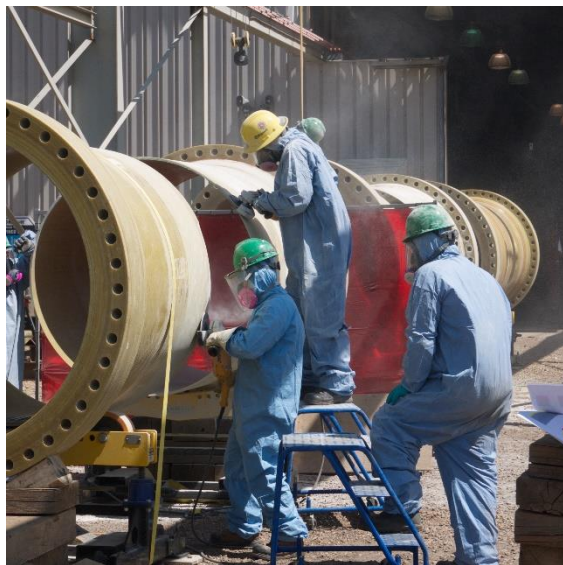
Predictable quality GRP piping installation.

Composite pipes are used as the better alternative for Steel pipes. One important argument is their excellent corrosion resistance. Even in relatively young existing projects, (corroded) steel pipes frequently are replaced by composite pipes.



"sanding surface"

An end-user (oil company) in Canada has decided already at the start of a new de-oxidizer plant to make use of Composite pipes for the transport of fluids with a high oxygen content. In this project, Composite pipes have diameters up to 1.400 mm. The pipes are



"sanding and bevelling"

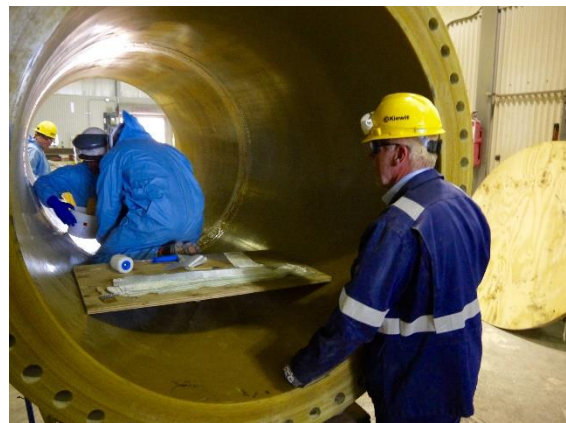
manufactured by FPI Hardenberg, The Netherlands.

The End-user want from the manufacturer a predictable quality: for the product and for the installation.

One joint failure during a hydro test results in questioning the whole installation and consequently to quite some costs of repair. At the contrary no joint failures during the first hydro test gives confidence about the installation.

The installation shall be based on the ISO 14692 completed with the end-user QA standards. The installation on site is executed by a Canadian experienced contractor.

The End user standard, described all pipes and components have to be factory tested before shipment to Canada. *"So far so good, but there is more"*.



"inside job"

DNV GL Certification of persons

To get a predictable quality the End user and manufacturers installation and assembly procedures needs to be understand and followed by the contractors crew. For this the installation is executed by well trained and DNV GL (independent) Certified Specialists. Specialists who recognize and understand their important role to create quality according the given standards as individual person and as a team as well.

The Canadian crew, 18 persons, have a background as pipefitter for steel or /and composite pipes, QA specialist or as mechanic

engineers. This crew followed a 2 week FPI training on site: theory and practice.



"theory exam"

Independent examination (testing of competences)

This installation crew have to pass a theoretical and practical exam without any help. DNV GL authorized and independent examiners are monitoring these candidates.

The examiners check **if candidates:**

- Know and understand the FPI manufacturers procedures related to the ISO 14692 standard
- Do have the skills to read and execute the procedures in practice
- Understand their important individual role and their role as a team in the total Quality chain. (Joints in pipes with this sizes have to be made in teams)



"laminating structural layer"

- Are able to communicate around quality aspects
- Able to perform as a real professional, to the stringent and high requirements and

demands of the end-user. All to get the important predictable quality of the joints and composite pipe installation.

Quality = specific knowledge + experiences + the right attitude.

During the exam the candidates will be questioned by examiners:

- About their impression of QA issues, like forms, storage, damage of products, the assembly instructions etc.
- Improvements around the way, quality can/has to be realized
- Showing the right Attitude (= related to Human factor management)



"hydro test"

The result:

Candidates have shown the right competences, skills and attitude to operate as individuals and as a team in creating the needed predictable quality for the end-user like.

"an Exam is just a moment for candidates to pass or to fail..."

Based on our global experiences in theoretical and practical exams based on procedures of many manufacturers and end-users, we are confident that this way of examining competences of professional installers is an excellent method to improve the needed QA and Sustainability of future Composite Pipe installations

This will favour the end-users and consequently the Composite pipe industry.