

Automation Done Right – Do's and Don'ts

One of the key components of any oil and gas project are pipes. Whether it is a refinery, a tanker, an offshore rig, or simply a cross-country pipe-line, it is impossible to complete without extensive piping systems.

Considering both the ubiquity of pipes as well as the growing scarcity of skilled welders, it is quite reasonable to look into ways to automate their fabrication, in order to reduce both operating expenses and man-power needs.

However, there are a lot of potential pitfalls and mistakes that can cause significant challenges or additional costs for any company that attempts to automate their pipe-spool pre-fabrication. It is therefore crucial to be mindful of a number of things.

3R solutions is an expert in the field of pipe-shop automation, and has implemented projects all over the world for more than 40 years. They have helped their customers reduce fabrication times by up to 50% compared to conventional fabrication, while their software suite has helped reduce the time some customers spent on planning, tracking, and documentation of workshop activities by up to 90%.

This article is intended to share some of their experience and expertise. However, while 3R solutions is an expert in pipe-spool prefabrication, a lot of the ideas and principles discussed here are also applicable for other aspects of fabrication, and can be modified accordingly.

Why should you automate?

The industry is changing. Every year there are new methods, new technologies, and new approaches on how to make fabrication more efficient. At the same time there is a problem of growing demand contrasted with a decreasing supply of skilled workers. Simply said, there is too much work for too few people.

This means that increasing the man-power



By automating the infeed and measuring, cycle times at a band-saw can be reduced significantly.

on your shop-floor is not a viable long-term strategy, as you will find it harder and harder to not only find new workers, but also to retain your existing work-force, which will of course be aware of the high demand their skills are in.

The solution therefore is to make use of your existing workforce as efficiently as possible. And this is where automation is an obvious approach.

However, you should never automate just for the sake of automation. Instead automation

should always have three goals in mind.

It should make the processes:

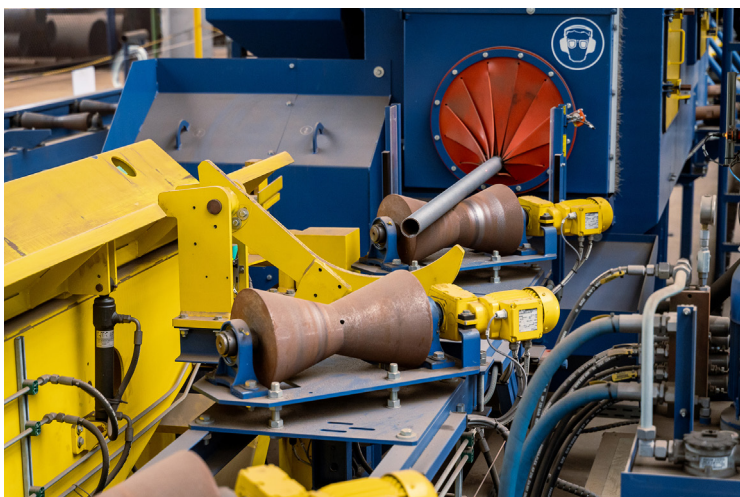
- Faster.
- Cheaper.
- Safer.

If automating a process does not satisfy at least two of these three criteria, then you should reconsider, and carefully weigh the costs and benefits. If your worker can perform a task in three minutes, at no risk and with no extra costs, then there is no point in spending money on a system that will do the same job in the same or more time. On the other hand, if the task is risky, or takes a worker a long time, and a mechanized system can do the same job faster and without risk, then automation is a worthwhile investment.

How should you automate?

Unlike for example the automotive industry, in oil and gas it is usually not viable to automate the entire fabrication process. This is because of the different types of projects in the two industries.

In automotive production there is a very limited number of different parts, but these parts need to be fabricated in high volumes, sometimes tens or even hundreds of thousands of times. In oil and gas projects on the other hand you may have tens of thousands of



A shot blasting machine cleans the pipe's outer surface, making welding processes easier.

different geometries, each of which has to be fabricated only a few times, often even only once. In addition the automotive industry often uses calibrated pipes, with small diameters and very low tolerances, while the oil and gas industry uses larger pipes and standards are more lenient when it comes to aspects such as out-of-roundness (ovality) or wall-thicknesses, often allowing tolerances of several millimetres.

For these reasons the use of robotic fabrication cells, which can be run autonomously without the need for any operators is quite feasible and common in the automotive industry, while a similar approach is significantly less viable for the oil and gas industry.

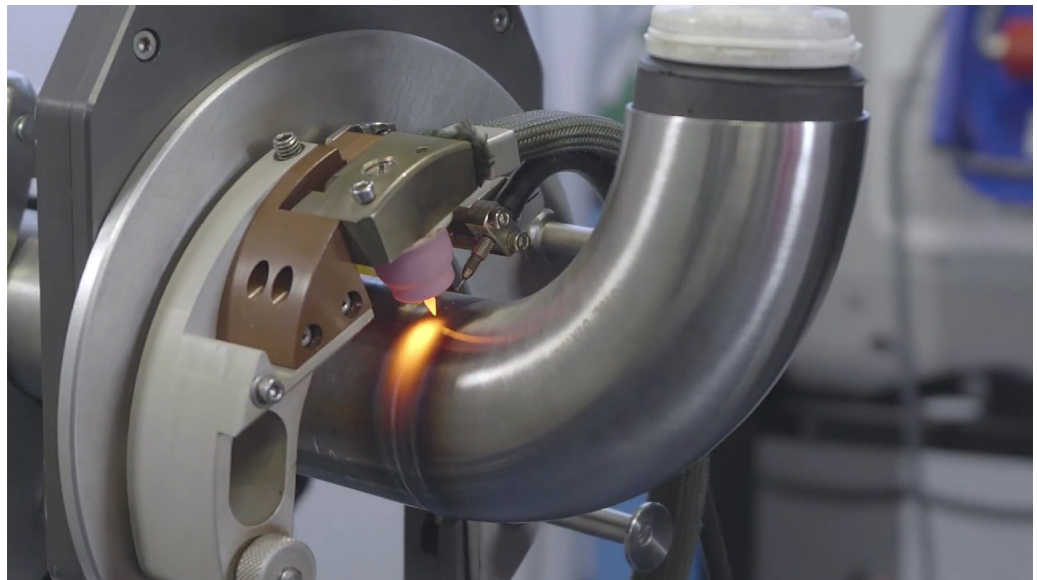
A better idea for companies in the industry is therefore a combination of mechanized systems, which assist the operator by automating part of the process, and conventional fabrication for all those tasks and processes where automation is not economically viable.

This can include loading fittings into an automated, mechanized welding machine, laying a manual root for a 2D or 3D joint that is then completed using an orbital welding machine, or manually marking a cut piece of pipe with an ID number, rather than using an inkjet barcode printer to print a 2D barcode representing that same ID number directly onto the pipe.

There are still a lot of tasks that can and should be automated, because they can help save significant time, even though other tasks are continued in a more conventional manner.

These tasks and processes include:

- Shot-blasting pipes in order to not only achieve metallurgically clean surfaces for welding, but also to reduce wear on band-saw blades and bevelling bits.
- Using automated handling systems, like roller-conveyors and buffer tables, in order to reduce use of overhead cranes and floor transport.



- Automated length measuring for cutting, significantly reducing the time spent on incidental work and increasing utilization of your cutting machines.
- Use of software to provide work orders directly to the operators, fitters and welders, and to achieve full real-time traceability of materials and worker performance.

What to avoid when automating?

Just as automation can bring a lot of benefits, there are also a number of risks and drawbacks, which you need to be aware of, so you can avoid them.

These include, but are not limited to:

- Automating for the sake of automation: as mentioned earlier, automation should always serve the purpose of making your fabrication cheaper, faster, or safer. If a machine or system fails to meet any of these criteria, then there is no tangible benefit compared to conventional methods, and automation has become an end of itself, rather than a means to an end.
- Automating too little / the wrong process: always be aware of connections and interdependencies in your workshop.

Any changes you make to a process will impact other processes. Unfortunately, however, a lot of shop managers focus only on part of their fabrication, usually the welding, because it is the most important aspect of fabrication, and is the one where problems and bottlenecks become obvious. However, improvements in welding will only be a partial solution if the actual problem is in work preparation / planning, cutting, handling, or edge preparation. And if a welder spends only 20% of their time welding, and 80% doing other work, then the goal should be to reduce the time spent on this other work, rather than the time it takes to weld a joint.

- Automating too much: at some point investment in automation will hit diminishing returns. This is because for every fabrication process there are parts that can easily be automated, while others become significantly more complex. Because of this at some point increasing the level of automation becomes exponentially more expensive. Especially in the oil and gas industry with its extensive range of requirements in terms of materials and dimensions, it may be more economically viable to focus on a key range of dimensions and processes, rather than trying to automate everything. Or in other words, if you can achieve 80% automation for an investment of X, 90% may easily cost you 3X, while 100% automation may cost 8X or more.

In any automation project it is therefore a good idea to get outside help from people who have successfully implemented projects before. Better to invest a little money in a consultant like 3R solutions, than to incur significantly higher costs for a workshop that does not meet your needs. •

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3R Solutions GmbH

Web: www.3r.de

YouTube: www.youtube.com/c/3Rsolutions



With an automated transport system no machine or worker has to wait for material, but can work continuously.