

Making welding mechanised

Matt Steel, RMS Welding Systems, USA, details the mechanisation of welding and the importance of accurately executing a project.

In today's demanding industry the need for a sub-contractor that can supply equipment, support and expertise is more important than ever. The size of the project does not matter. Whether it is a complex, multiple spread; larger than 500 km; a smaller 10 km pipeline; a 2 km pull section; or fabrication work, RMS Welding Systems (RMS) has the capability to support it. With management having greater than 100 years of combined pipeline experience specialising in mechanised welding, RMS is able to tailor an equipment package and provide leading industry expertise in mechanised welding to remove all concerns in the ever-changing oil and gas pipeline industry.

Equipment selection

Selecting an equipment package that blends financial impact and project requirements is critical for mechanised welding. RMS offers a full range of equipment that can be utilised for any type of pipeline project.

If high production is required, RMS's Internal Welding Machine (IWM) in conjunction with the MOW II external dual torch welder is capable of welding pipe at up to 4 km/day.

The IWM is used for lining up, and internally holding two sections of pipe in position, and applying the root pass from the inner diameter of the pipe. It is capable of welding pipe ranging from 24 - 48 in. diameter and has a weld-to-weld cycle time of 2.5 - 3.5 min. and welding times of 0.9 - 1.1 min.

As the oil and gas industry continues to demand the need for low-hydrogen welding processes, the MOW II supports both flux core gas metal arc and pulse gas metal

Figure 1. Flux core gas metal arc tie-in configuration.



arc welding with the ability to be configured in single-torch, dual-torch or tandem torch. Through the benefits of a narrow groove and the low heat-input pulse gas metal arc welding the necessary quality and mechanical properties needed for today's higher grade pipe can be achieved. In the past five years, over 2000 km of pipeline has been laid with an average repair rate of 1.6%, utilising pulse gas metal arc welding. The MOW II offers



Figure 2. MOW II dual torch welding.



Figure 3. Procedure qualification coupons ready for mechanical testing.

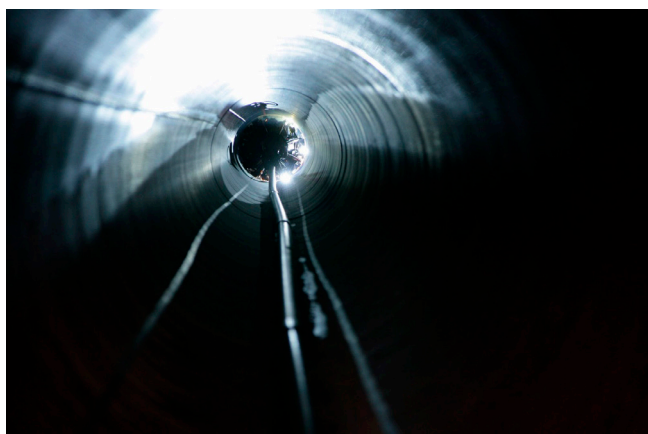


Figure 4. Internal welding machine in action.

digital control and monitoring of all critical weld parameters, and features through-the-arc, tip-to-work distance and weld seam tracking.

If high production is not as great of a concern, RMS offers the capability to weld utilising a copper back-up line-up clamp. In doing so it still utilises the benefits of reduced crew size and pulse gas metal arc welding with the MOW II.

For tie-in welds the MOW II can be configured in single-torch, utilising the low hydrogen process of flux core gas metal arc welding. In doing so, the digital control and monitoring capabilities of the MOW II ensures the welds are within the parameters set by the welding procedure. This allows a decrease in production times of around 30 - 50% compared to the conventional downhill shielded metal arc welding process.

Not only does RMS offer mechanised welding equipment, all supporting equipment to make a project succeed is also available. To completely protect the welding from the elements to allow production to continue in virtually all weather conditions, a solid walled shack for mainline or a half-solid and canvas shack for smaller areas (such as tie-in applications) are available. To power the welding equipment, RMS has generators and decks that can fit any conventional side-boom configuration. All equipment leaves the shop fully tested, rigged up and ready to go in the field – this allows the equipment to start working in as little as a day after arriving on site. This eliminates the time and cost of rigging up the equipment once it arrives on site.

Welding procedures

Once an equipment package has been selected, RMS in-house welding engineering department will develop a welding procedure qualification plan that will ensure all company and regulatory requirements will be met. RMS has the capabilities and experience to develop and manage a complex acceptance criteria, multiple process, pipe diameter, wall thickness, pipe manufacturer or a more standard workmanship procedure qualification campaign.

As the requirements for today's pipelines are becoming increasingly more stringent, with the use of higher grade materials becoming more prevalent, the need for a consistent, high quality, low-hydrogen and mechanically superior weld to the conventional manual shielded metal arc welds is key. These requirements demand the use of mechanised welding.

Working closely with the contractor and owning company, a qualification plan will be developed to meet all the necessary project welding and industry requirements. Upon agreement of the qualification plan, RMS will execute the welding campaign at either of its two facilities in Texas or Alberta. Throughout the procedure execution stage RMS will interface with all necessary parties to ensure the project's success. All necessary documentation to ensure that the welding is compliant with the project's requirements will be thoroughly maintained and developed throughout the entire process. Upon completion of the welding campaign, RMS will continue to provide the necessary oversight during the mechanical testing and possible engineering critical assessment stage to ensure on-time delivery and compliance. Once all of the welding and mechanical testing has been completed, RMS will develop and supply all



Figure 5. Welding on the right-of-way.



Figure 6. Welding of procedure qualification welds.

welding procedure specifications with the necessary supporting information to the project. The whole procedure development programme will be undertaken in the most efficient and cost effective way, without jeopardising the quality that the oil and gas industry demands.

The complete procedure planning and execution was recently executed for the Atlantic Coast Pipeline and Mountain Valley Pipeline projects. RMS qualified procedures for: internal welding machine, copper back-up, hybrid shielded metal arc welding with mechanised flux-core, and manual shielded metal arc welding for tie-ins and repairs. The complexity of the campaign was made more complicated as multiple pipe and plate manufacturers for 42 in. and 36 in. pipe diameters with wall thicknesses ranging from

0.515 - 0.864 in. were needed to be qualified. Not only were the welding procedures executed and managed by RMS, there was direct involvement in the mechanical testing and development of the engineering critical assessment to ensure practical industry standards were implemented.

Project execution

All of the welding and supporting equipment will be shipped to the job site where experienced technicians will be ready to rig-up the equipment as soon as it arrives. As the equipment is fully tested prior to leaving for the job site, the field rig-up time is minimal. Even though the equipment was tested prior to getting to site, upon completion of the field rig-up it will be tested again by the technicians to ensure everything is working properly and ready for welder qualification.

Depending on the welder's skill set and familiarity with the equipment, it is recommended that the welders perform a number of practice welds under the supervision of the onsite technicians – prior to the actual welder qualification test. According to most industry standards for mechanised welding, only one welder qualification weld on the heaviest wall thickness is required for the welder to be qualified.

Once production has started, dedicated technicians will service the mechanised welding equipment on a daily basis to ensure everything is operating at its peak performance. In the event something breaks, a full array of spare parts and equipment is sent to the project to allow the technicians to fix any issue with as little production downtime as possible.

The technicians work closely with the welders, welding foreman and non-destructive examination operators to identify any possible trends in repairs. In doing so they are able to adjust equipment or welding parameters to eliminate any potential future repairs. Not only is there direct oversight in the field by the technicians, there is continuous monitoring of production performance and repair rates for trends by office personnel. In the event of any negative trends appearing, they will communicate with the necessary field personnel to ensure appropriate measures have taken place to eliminate the trends.

The majority of RMS work is on the front end of the project prior to even striking an arc for production. Everything including welding procedure qualification and write-up; equipment overhaul and shipment; delivery of spare parts and wire to a central location; and welder qualification happens prior to production kick-off.

Conclusion

As the oil and gas pipeline industry evolves to more stringent requirements, the demand for a mechanised welding where the human element is minimised and controlled, is prominent. Starting out working within the project requirements and closely with the contractor, a mechanised equipment package can be determined. From there a detailed welding procedure qualification campaign will be developed and executed. Upon completion, all necessary equipment will be overhauled, tested and mobilised to the project. Once on site, technicians will service and maintain all equipment and work side-by-side with the welders to ensure optimal production and quality is maintained throughout the life of the project. 