Nuclear Grade Welding Concerns in the Nuclear Renaissance

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SCOPE

- Parsons Corporation is contracted with the DOE Savannah River Site to design, build and operate the Salt Waste Processing Facility (SWPF).
- Facility will concentrate radionuclides from stored liquid waste for processing at the Defense Waste Processing Facility (DWPF).
- The SWPF will have approximately 23 miles of stainless steel process piping, much of which is safety significant.
- Requires enhanced weld quality and inspection verification.
- This paper discusses the quality control processes utilized to assure the process piping for the SWPF meets applicable requirements for safety significant systems and components.
- Examples of: weld processes used, different quality of welds, and non-destructive weld inspection results will be demonstrated.
Welder Certification Testing Programing

- Weld testing meets the requirements of the ASME Section IX and the AWS B2.1 welding codes.
- Adapting testing requirements to supply welders that have the skills to perform small bore piping has been essential.
- Additional testing for entry level welders on small bore piping exceeds the basic code requirement.
- RT rejection rates have dropped from over 20% to approximately 6%.
- Structural and plate welding testing meets requirements of the AWS B2.1 Welding code, which offers more versatility in base metal and filler metal field ranges.
- Testing is monitored by Parsons Welding Specialist to maintain consistency with final product, which is good welders.
Machine Orbital Welding Program

• Each welder attends 5 days hands on training on the Magnatech Orbital Welding system culminating with the candidate passing a weld test.
• The 433 Magantech welding head is good for 2”NPS through 6”NPS pipe.
• The Redhead Magnatech welding head used with ½” NPS through 1 ½” NPS pipe.
• Operators require 2 more days of training on the Redhead with test on a 1/2”NPS to qualify.
• Parsons Welding Specialist have:
  ▪ Written all welding programs for pipe sizes from ½” - 6”
  ▪ Performed Bends, Tensiles and RT to verify quality of all welding programs.
• Uses a D-head from Magnatech for piping with limited access as the D-Head only requires a 2” spacial envelope.
• Parsons Welding Specialist attended Magnatech Maintenance school allowing minor in-field repairs on equipment.
Autogenous Welding Program

• Each welder attends 3 days training on the autogenous welding system culminating with candidate passing a weld test.
• Autogenous welding requires the deposit of no filler materials and bonds two pieces of square butt pipe.
• Major advantage to autogenous welding is the square butt joint preparation requires very little labor cost to prepare pipe.
• The system is used on pipe from 2”NPS to ¼” NPS and a .154” wall thickness.
• Close attention required because the system can only work on long tangent fittings.
• Metal composition critical:
  ▪ Sulfur must be held to over .05% to maintain good weld quality.
  ▪ Copper content effects the joining process.
Summary

- Parsons is having great success in producing high quality welds in the field by:
  - Demanding a highly skilled welder proven through weld testing and training;
  - Supporting field operations with proven Welding Specialists to support craft and proctor all testing and training;
  - Monitoring welder acceptance verses rejection rates to assure levels in the field are held to a high standard. If the rejection rate does not improve then Welders project certification is pulled;
  - Advancing the automated welding of piping to assure the technology is applied correctly and produces welds with a very low rejection rate <1%; and
  - Committing Welding Engineering to Continuous Improvement on all welding processes to assure reduction in weld rejections rates.
MAGNATECH 433 HEAD ORBITAL READY FOR ROOT PASS
MAGNATECH 433 ORBITAL WELDING HEAD ROOT PASS
ORBITAL WELDING HEAD COMPLETION OF ROOT PASS
ORBITAL HEAD COMPLETION OF SECOND WELD LAYER
ORBITAL WELD COMPLETION OF THE FINAL PASS
BETTER VIEW OF COMPLETED ORBITAL WELD