



# High Productivity Reduced Emissions Arc Gouging Process

*An EHS Panel Project Proposal*

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# NSRP EHS Panel Project Proposal

- High Productivity Reduced Emissions Arc Gouging Process
  - Testing and Shipyard Trial of “WeldVac” – A Patented Metal Removal Method
    - Evaluate productivity and quality of metal removal
    - Evaluate environmental improvements – noise, fume, opacity
    - Evaluate impact on other aspects of shipbuilding, maintenance, and repair operations
    - Perform a trial at Vigor Shipyard, Seattle
- Project Team
  - EWI (prime)
  - BSI Group
  - Vigor Shipyards
  - CSK Mechanical
  - VT Halter Marine

# WeldVac Potential (1 of 2)

- It is entirely possible to eliminate 75% of the labor and materials for “protection” that now must be used to prevent damage to adjacent equipment where carbon arc gouging (CAG) is performed.
- Significant schedule improvement will accrue. Adjacent operations can be scheduled for work due to the quiet and clean nature of the process.
- WeldVac is sufficiently quiet that other operations may proceed nearby.
  - Tests proposed are expected to demonstrate sound levels below OSHA noise limits.
  - WeldVac is sufficiently quiet that hearing protection would not be mandatory from process operation.
  - The noise contribution of this process is anticipated to be below 90 dBA at the operator work area.

# WeldVac Potential (2 of 2)

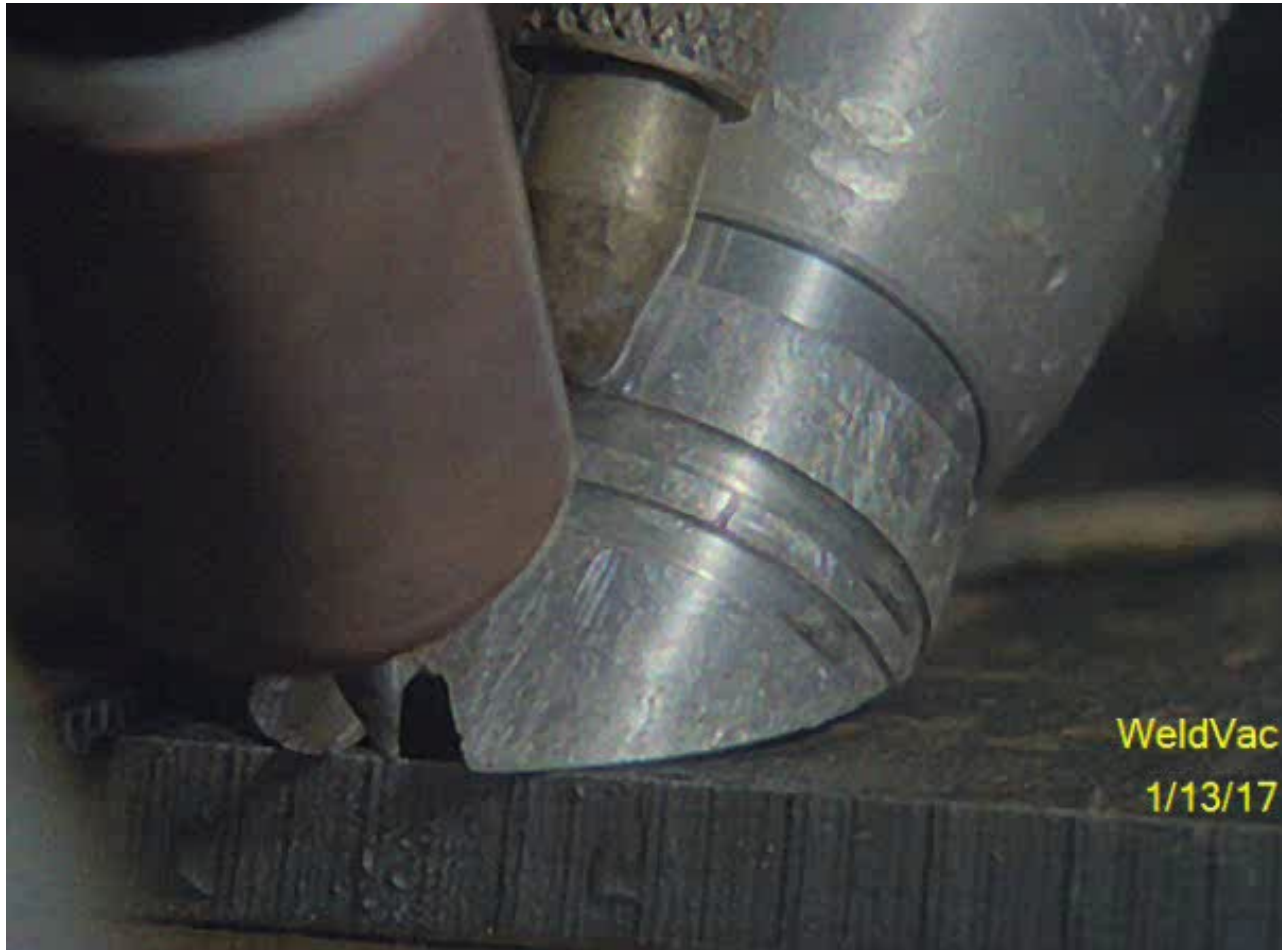
- WeldVac produces very low levels of smoke and fume.
  - The level of fume generated by WeldVac will be shown to be below existing opacity limits.
  - Work can be performed efficiently by all other adjacent operations, with little need for respirators (unless mandated by other operations or company policy).
- Cost of cleanup will be reduced due to capture of nearly all slag and dust.
- Another advantage is that a high-pressure air supply is not needed.

# WeldVac Alpha Prototype



Key: A-Heat Source, B1-Vacuum Nozzle, B2-Vacuum, C-Capture Chamber

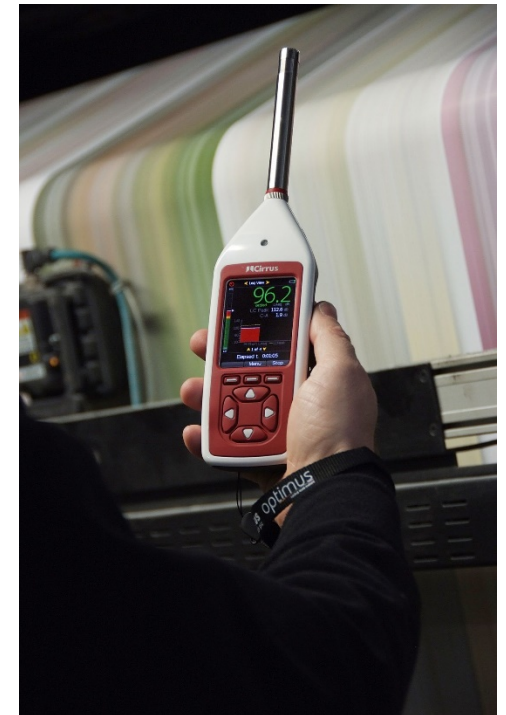
# Alpha Prototype in Operation



Video shot using Visible Welding V2016-Z WeldWatch camera system ([www.VisibleWelding.com](http://www.VisibleWelding.com)).

# Environmental Testing

- BSI Group will perform all environmental testing. Written report of results will provide comparison of noise levels and air contaminant concentrations generated by carbon arc gouging versus WeldVac.
- Noise Monitoring
  - Use Sound Level Meter to measure noise, in dBA, in accordance with OSHA Standards in 29 CFR 1910.94.
  - Measurements taken in and around the work area during each phase of evaluation, using a hand-held Sound Level Meter.



# Environmental Testing

- Air Monitoring - Collect personal breathing zone and area air samples for total weld fume (as total particulates) and respirable particulates in the following testing plan:

	Area – CAG	Operator – CAG	Area – WeldVac	Operator – WeldVac	Total
Total Weld Fume	1	1	1	1	4
Respirable Particulates	1	1	1	1	4

- It is estimated that each phase of testing (with CAG and with WeldVac) will last about two hours, allowing testing for both evaluation periods to be conducted in one workday.





# Statement of Work

- Task 1 – Project Initiation and Kick-off Meeting
  - Set up a WeldVac system at EWI, in Columbus, Ohio
  - Meet with team members
    - Determine performance testing joint designs, positions, and requirements
    - Identify procedural boundaries (i.e., weld sizes, methods, etc.)
    - Determine the parameters to be tested (noise, breathing zone, fume generation, productivity, etc.).
    - Determine metal removal rates (e.g., lbs./hr. or linear fpm of fillet weld)
  - Finalize the project plan
- Task 2 – Identification of WeldVac Parameter Sets
  - Perform initial WeldVac trials to determine modifications to test plan
  - Develop parameter sets for fillet and other weld removal scenarios that meet needs
    - Determine suitable parameters and weld removal sequencing
    - Identify shipyard-friendly procedure aspects
    - Perform appropriate environmental tests for the shipbuilding materials of interest
  - Determine removal rates, heat inputs, and other data to inform a clear business case analysis
- Task 3 – Demonstrations and Implementation
  - Demonstrate the WeldVac methods at a participating shipyard
  - Document the results achieved
- Task 4 – Technology Transfer and Reporting
  - Prepare technology transfer presentations
  - Generate quarterly reports
  - Prepare a final written project report

# Questions



**See Cover Sheet for Distribution Statement**