



AET Overview-Relevant to Shipbuilding Welding

Who We Are

- AET Integration, Inc. is a technology firm **specialized in R&D and Engineering in welding and joining**, as well as related material engineering services.



*2007 Henry Ford
Technology Award*

Our Major Customers

GENERAL DYNAMICS

B&W thebabcock&wilcoxcompany
a McDermott company

OAK RIDGE NATIONAL LABORATORY

 Pacific Northwest National Laboratory
Operated by Battelle for the U.S. Department of Energy

CATERPILLAR[®]

Schlumberger



HONDA

HITACHI
Inspire the Next

A123
SYSTEMS



BorgWarner
Turbo Systems



 American
Iron and Steel
Institute



Hyundai KIA America Technical Center, Inc.


WORTHINGTON
INDUSTRIES

Johnson
Controls

NUCOR




ALCOA

senior
Flexonics


Fraunhofer USA

A/S
P Auto/Steel
Partnership

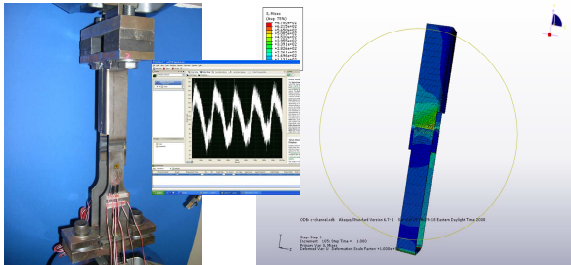
Severstal


AET INTEGRATION

Fatigue R&D, Engineering, and Testing

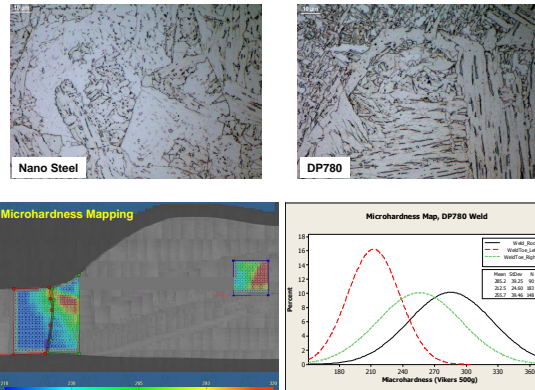
Driving Forces:

Applied Load
Stress Concentration Factors
Residual Stresses



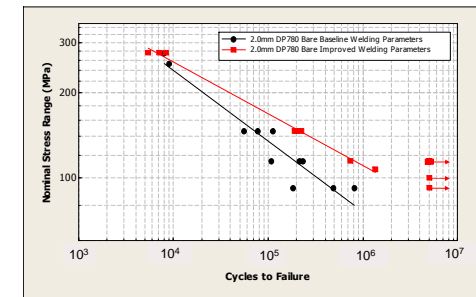
Resistance:

Base Metal/Weld Joint Properties



Fatigue Performance:

Low Cycle Fatigue
High Cycle Fatigue



AET Lab Capability

Static/Fatigue Testing

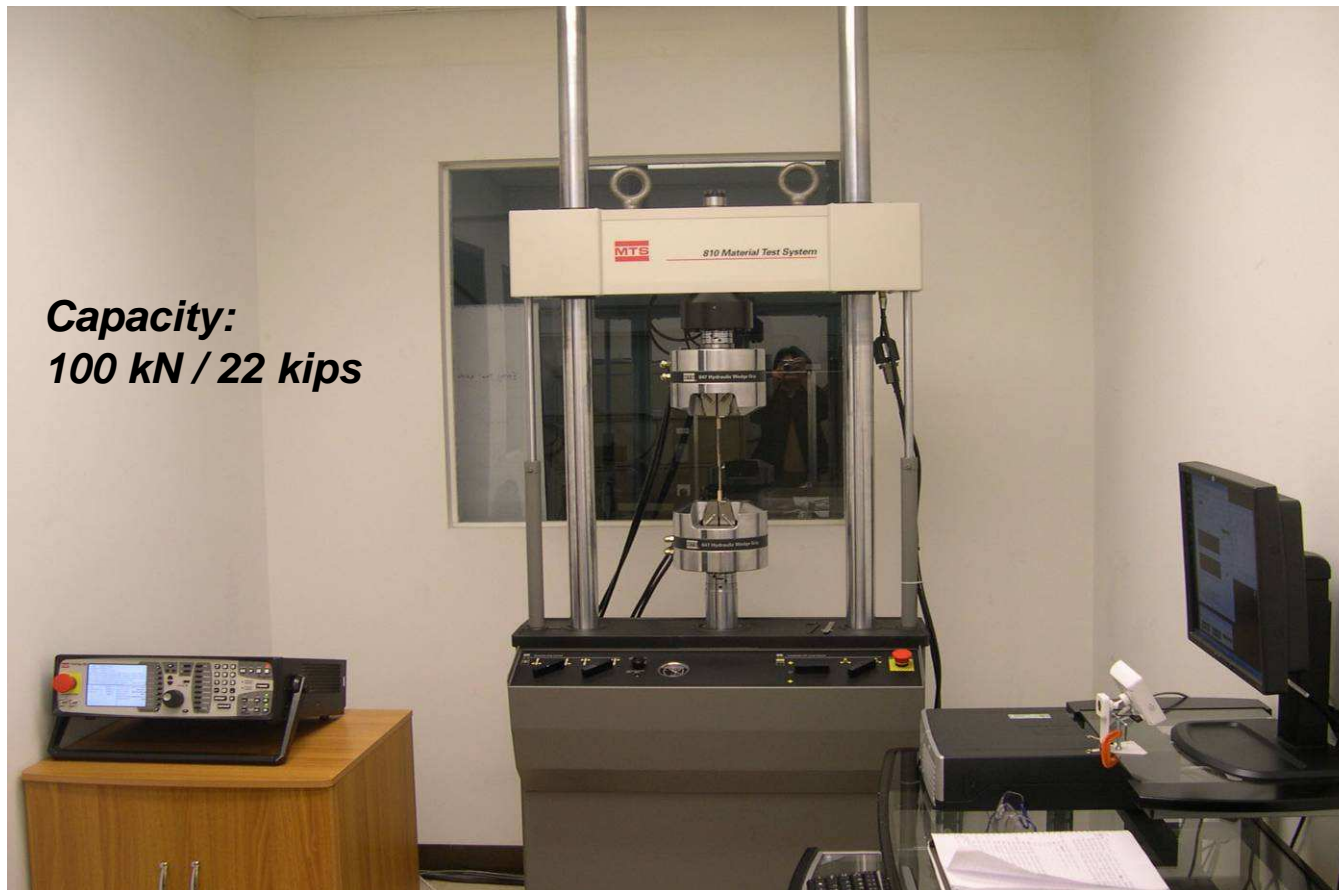
- Welded Joints
- Base Materials
 - Metals
 - Composite Materials

AET Lab Capability Static/Fatigue Testing



Capacity: 500 kN / 110 kips

AET Lab Capability Static/Fatigue Testing

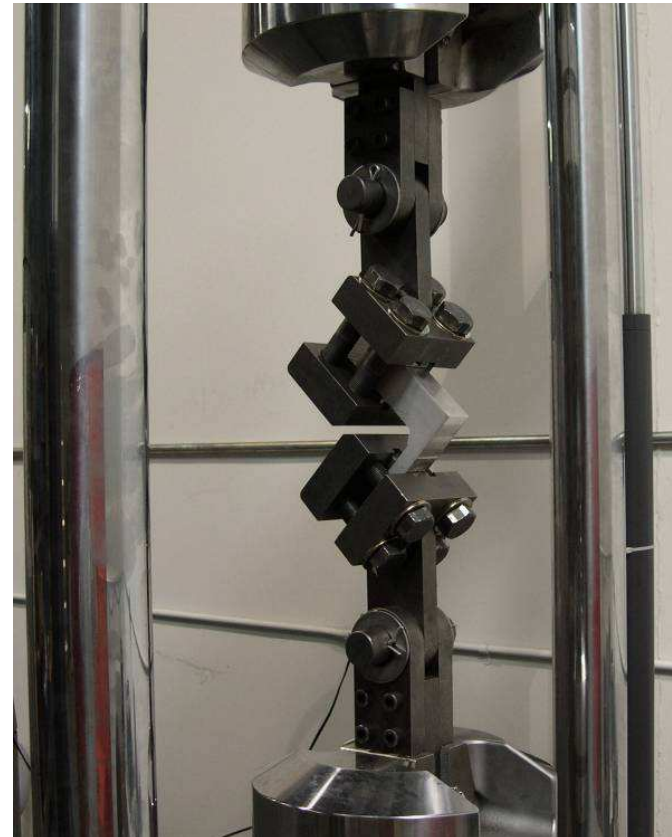


AET Lab Capability Static/Fatigue Testing

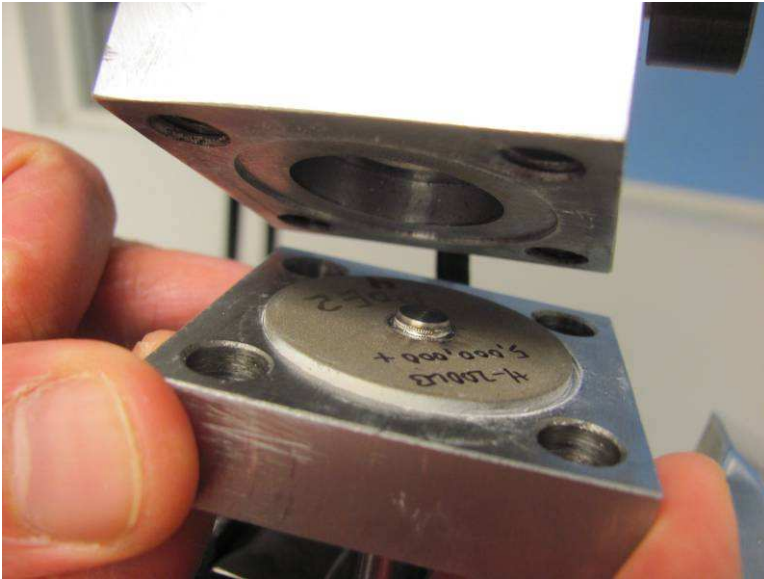
**Capacity:
15 kN / 3.3 kips
with chamber**



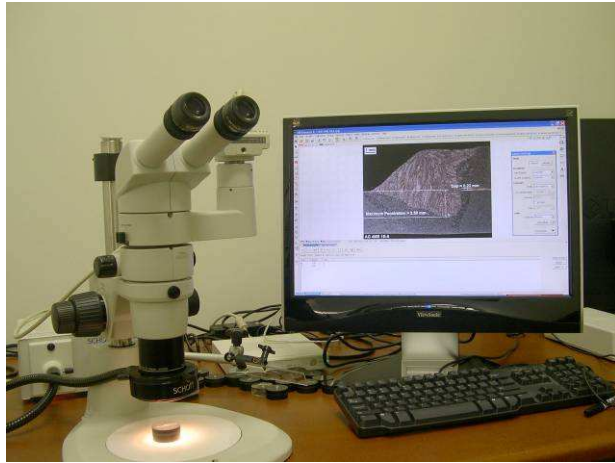
Fatigue Testing: *Customized Fixture Design*



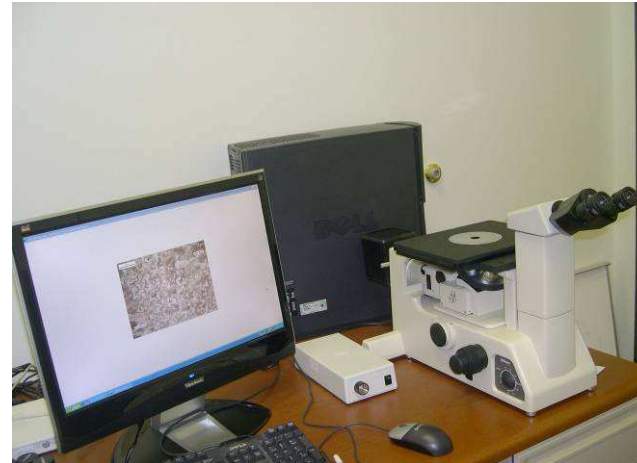
Fatigue Testing: *Customized Fixture Design*



AET Lab Capability Metallurgical Testing



Stereotype scope, up to 63x



Microscope, up to 1000x



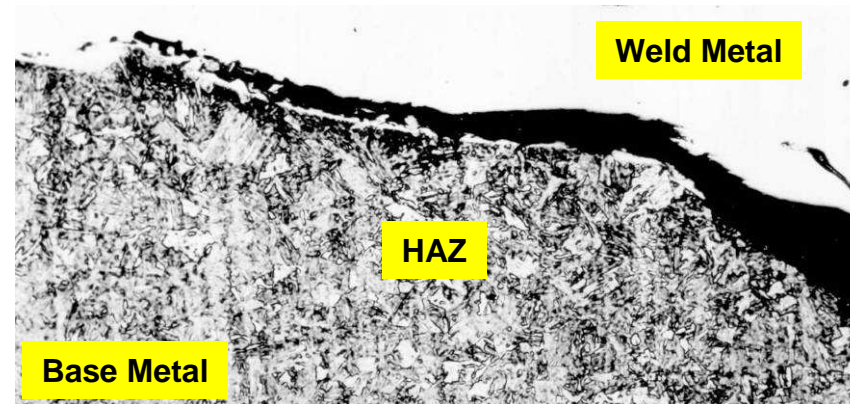
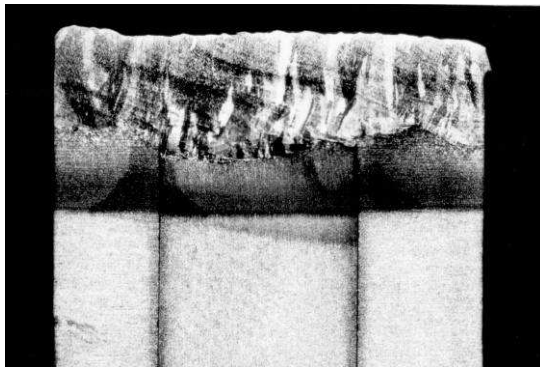
**Sample cutting, automatic mounting,
and automatic polishing machines**



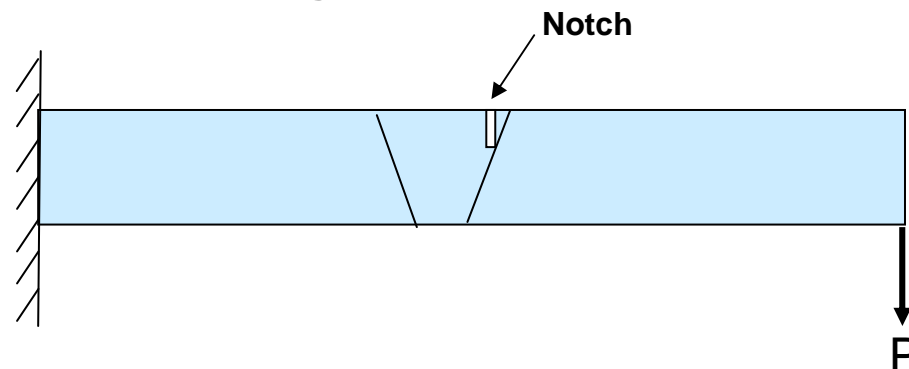
**Automatic Microhardness Tester
(for hardness mapping, etc.)**

Welding/Joining Experimental Design: *Select or Modify Available Test Methods*

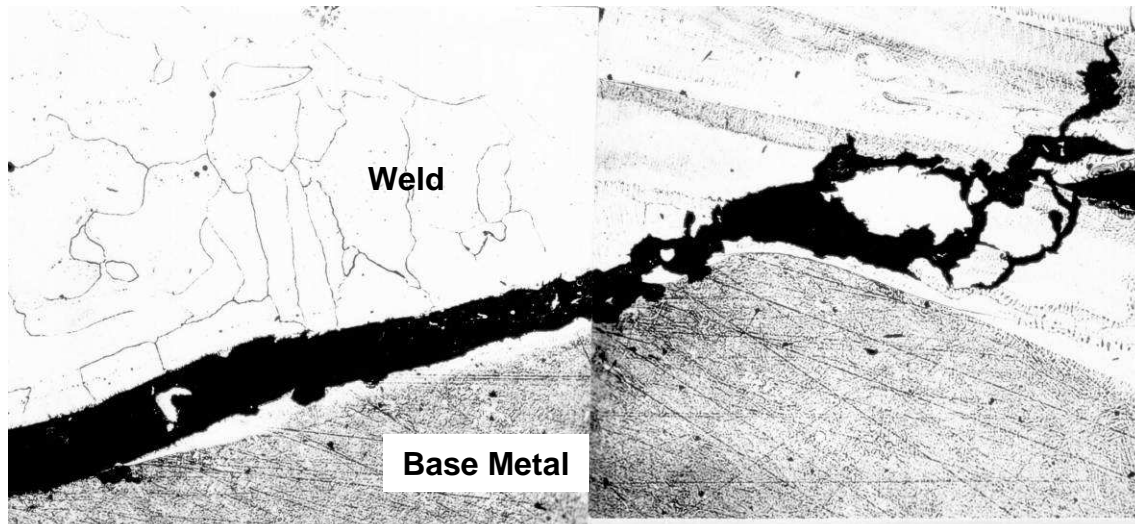
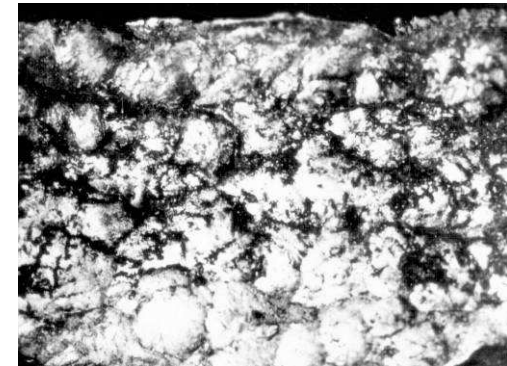
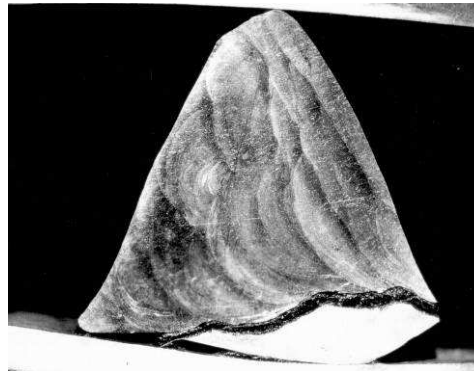
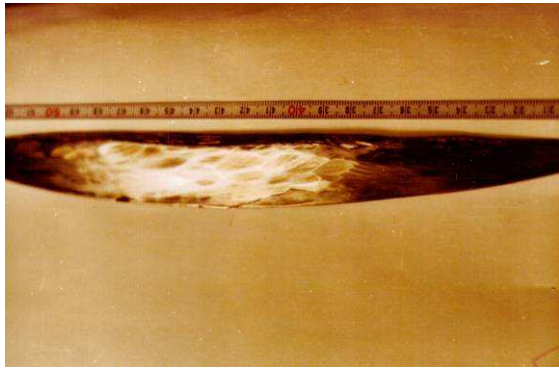
- **Modified Implant Test for Hydrogen-Induced Cracking in Unmixed Zone of a Dissimilar Metal Joints (notch was placed in Unmixed zone instead of HAZ)**



- **Cantilever Beam Test to Simulate Effect of Weld Residual Stresses on Hydrogen-Induced Cracking**



Failure Analysis & Failure Mechanisms: *Failure Analysis of Leaking of a 9% Ni Steel LNG Tank*

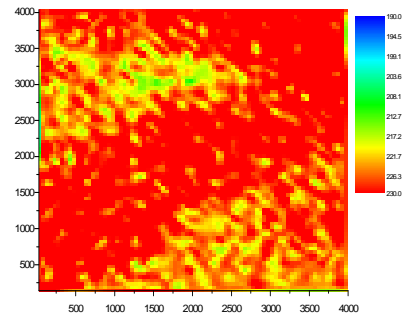


Failure Analysis of Leaking of a 9% Ni Steel LNG Tank : *Failure Modes and Repair Welding*

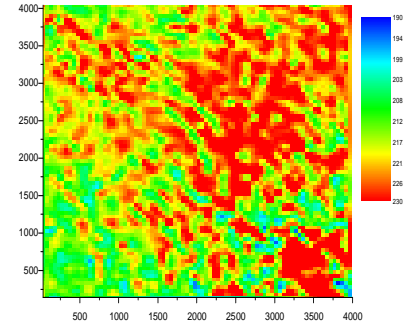
- Failure modes:
 - Hydrogen-induced cracking
- Repair welding: Nickel base electrode
- Field implementation: **no weld defects were found during regular service examination**

AET Lab Capability

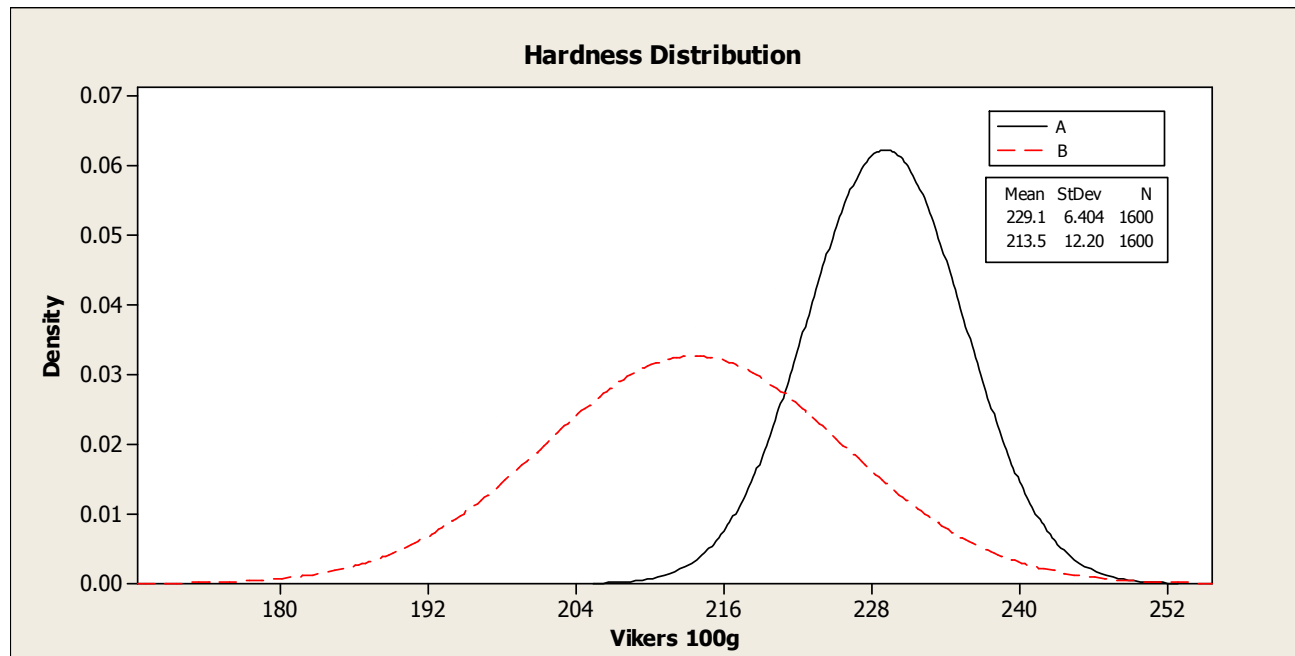
Microhardness Mapping and Data Analysis



Sample A



Sample B



WeldEdge

WeldEdge is a knowledge management and expert advisor system that enables rapid data/knowledge retrieval and new application development as related to material joining.

AET INTEGRATION **WeldEdge**

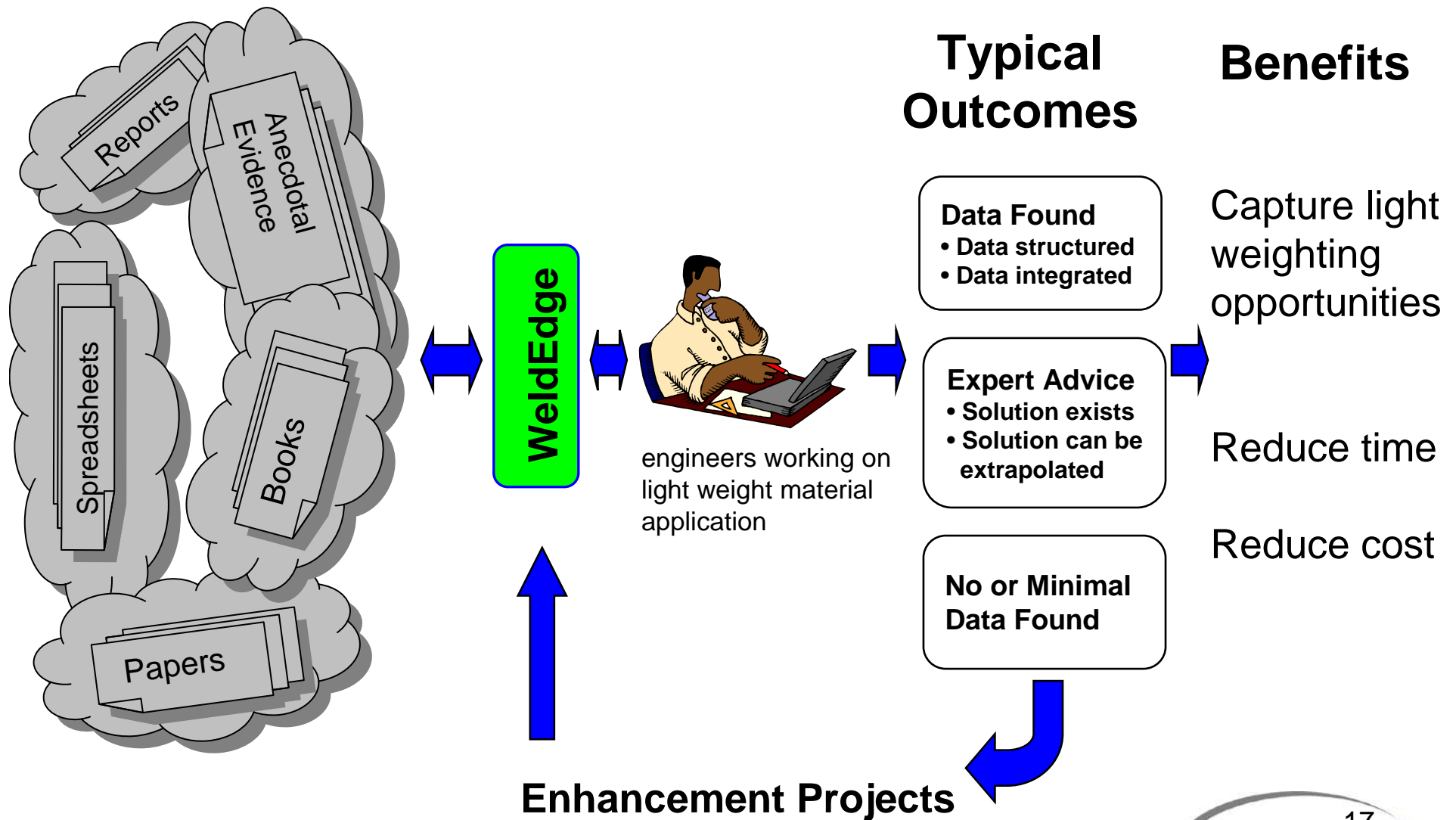
Version 1.0



A Knowledge Management and Expert System for Material Joining

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Future State



Benefits of WeldEdge System

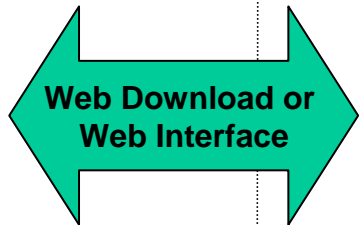
- **Enable rapid retrieval of the most relevant engineering data /knowledge rules as related to materials and joining**
- **Enable rapid development of new material joining application through simulating the expert thought process**
- **Reduce cost and time for training, data/knowledge sharing, and new development by integrating all material joining related data/knowledge rules into one powerful software tool**
- **Data analysis automation**
- **Sources of data/knowledge rules can be from USCAR/ASP programs and/or other public/private domain**

WeldEdge Implementation Model

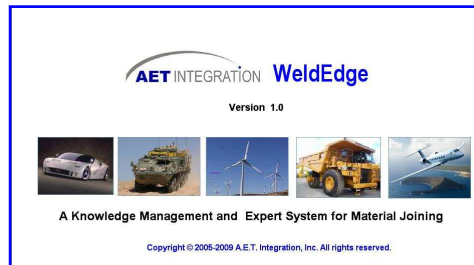
Engineers and
Other Users



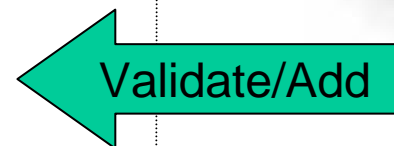
Desktop or Web-based
Applications



WeldEdge
Server / Data Storage



Customer Team



WeldEdge, Customers

- **Installed at General Dynamics Land System in 2009**
- **Scheduled to install for Auto-steel partnership in September 2011. (Consortium by GM, Ford, Chrysler, ArcelorMittal, Nucor, AK Steel, US Steel)**
- **Developing implementation project for Caterpillar.**