

## **Cold Spray Repair Virtual Forum Minutes**

**Event:** On 7 January, 2014, the Joint Technology Exchange Group (JTEG), in coordination with the DoD's Cold Spray Action Team (CSAT) and the National Center for Manufacturing Sciences (NCMS), hosted a three hour virtual forum on "Cold Spray Technologies and Processes Used for Repair".

**Purpose:** The purpose of the forum was to explore the collaborative roles the JTEG and CSAT have in promoting cold spray repair, and to present three different Cold Spray repair technology projects. The presentations, along with questions and answers, were conducted through Defense Connect Online (DCO). Over 60 participants from across DoD and industry joined in the forum. Questions were sent through DCO and answered by the presenters during the forum.

**Welcome:** Greg Kilchenstein, OSD(Maintenance) opened the forum with a welcome followed by a brief description of the JTEG's mission in supporting collaboration and information exchange.

**Definition:** Greg then provided a definition of Cold Spray and its current uses. Cold spray is defined as a low-temperature, solid state consolidation process, whereby metal or combinations of metallic and non-metallic particles are injected into a high-velocity gas stream and are directed upon a suitable substrate where they impact and consolidate to form a coating or freestanding structure, without melting. Cold spray is used to form corrosion and wear resistant coatings, and can also be used to provide dimensional restoration and a means to repair worn and/or corroded parts fabricated from a variety of materials including aluminum, titanium, magnesium and steel.

**CSAT:** Greg then introduced Vic Champagne, who is the Technical Team Leader of the Innovative Materials & Processing Team at the US Army Research Laboratory (ARL), and the leader of the CSAT. Vic described the CSAT as a forum to exchange ideas and collaborate for the purpose of implementing and transitioning cold spray technology. He also stated that the annual CSAT meeting will be held on June 18-19 at the Worcester Polytechnic Institute (WPI).

**Cold Spray Overview:** Vic then presented a very informative overview of cold spray technology in DoD and the commercial sector. He covered ARL Cold Spray development efforts to include a tri-Service program conducted in 2000, efforts to repair items in the storage, analysis, failure evaluation and reclamation (SAFR) warehouse, and current OSD ManTech efforts to transition cold spray repair technology into production. He noted a Cold Spray Technology for Aircraft Component Repair project that received an ESTCP (DoD's environmental technology demonstration and validation program) award, and stated that he would post the ESTCP report on the JTEG webpage once the appropriate permissions are received. Vic's presentation was followed by a very informative question and answer period involving more than two dozen questions. (The questions and answers for all four presentations are attached.)

**NAVAIR Cold Spray Initiatives:** The next presenter was Fred Lancaster who provided an update on NAVAIR cold spray initiatives. His brief included several H-60 and H53 applications and a project where NAVAIR is collaborating with the Royal Australian Navy on developing a

field deployable robotic cold spray system for mobile repair. Fred also explained a hierarchy of cold spray application projects beginning with corrosion and dimensional non-structural projects, progressing to structural projects, and finally ending with advanced powder/alloy development.

**Air Force Cold Spray Initiatives:** Brian James from 28<sup>th</sup> Maintenance Group, and Rob Hrabec of H.F. Webster Engineering Services presented U.S. Air Force advances in cold spray. Applications included magnesium and aluminum housing repairs, use of cold spray to reclaim unserviceable parts, cold spray automation, and a portable hand held high pressure cold spray system. They also played a video which showed several of these applications in operation.

**PSU/ARL Navy ManTech:** The last presenter was Tim Eden from Penn State/ARL who presented a condensed version of his Navy ManTech Cold Spray brief as we were running short on time. Tim mentioned that their efforts are primarily Navy funded and he noted a few efforts such as cold spray coatings with solid lubricants, plate inspection of cold spray repaired plates, ultrasonic inspection of the plates, and a cost model for calculating cost and spray efficiency.

**Closing Comments:** Vic's final comments were that he looked forward to continuing the collaboration and partnership between CSAT and JTEG. Greg's closing comments echoed Vic's above, and Greg also stated that he is looking at implementing more joint/holistic actions to drive cold spray forward.

**Action Items:** The following are actions from the forum:

- Post briefings on the JTEG Website at <http://jteg.ncms.org/> . Action; NCMS
- Send out unanswered questions to the presenters. Action: LMI
- Send out questions and answers (or a link) to all registrants. Action: LMI/NCMS
- Send out meeting minutes to all registrants. Action: LMI/NCMS
- Make a POC list of all registrants available and distribute. Action: NCMS
- Post to the JTEG website the ESTCP report on the Cold Spray Technology for Aircraft Component Repair project, once the appropriate permissions are received. Action: CSAT/LMI/NCMS
- Post the Cost Model that Tim Eden briefed on the JTEG website: Action: Tim Eden/LMI/NCMS
- Develop a cold spray repair repository or body of knowledge of available information that the community can access to leverage current and future efforts and opportunities. Action: OSD/CSAT
- Develop a joint roadmap or guidebook on how to take a capability and apply it to the whole range of applications across DoD. Should include transition, qualification, specifications & standards, and process specifications. Action: OSD/CSAT

Next JTEG Meeting: XX February 2014, time TBD

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