Department of the Navy SBIR/STTR Transition Program

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.
NAVAIR 2023-827

Topic # AF172-002
Demonstration and Validation of Brush LHE Alkaline Zn-Ni as a Brush Cadmium (Cd) Alternative
(ES3) Engineering & Software System Solution, Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: Fleet Readiness Center Southeast (FRCSE)

Transition Target: This effort will validate the brush Zn-Ni plating solution and process as a brush Cd replacement through a NAVAIR approved test protocol for eventual NAVAIR Letter of Authorization.

TPOC: (904) 790-6381
kami.e.carter.civ@us.navy.mil

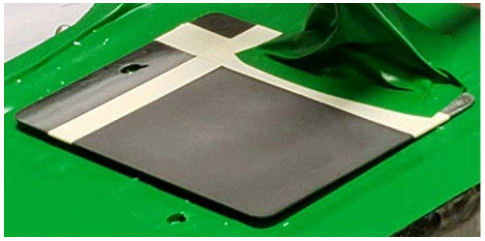

Image taken by ES3

Other Transition Opportunities: Transition of the process and solution can benefit all those within the FRC's and active-duty field locations. Brush Zn-Ni can be used for brush Cd replacement for any application, as well as touch up repair for Cd plated, Zn-Ni plated, and IVD aluminum coated surfaces.

Notes: ES3 successfully completed US Air Force Phase II SBIR Topic AF172-002, meeting its primary goal of developing an improved solution and process for brush Zn-Ni. Additionally, ES3 has designed a Dripless Tool (DLT) System through the National Defense Center for Energy & Environment (NDCEE). This tri-service effort includes a planned 2024 demonstration at FRCSE. In the future, ES3 plans to join this current solution and process with the DLT System.
Image: View of LHE Zn-Ni Brush Plated Sample

WHAT

Operational Need and Improvement: NAVSEA and NAVAIR naval vessels and aircraft structure and components are commonly LHE Zn-Ni or Cadmium plated, then in need of repair brush application. Currently, they do this repair work with brush Cd with a hexavalent chrome conversion coating, which are known carcinogens. This brush Zn-Ni solution and process developed by ES3 provides an environmentally friendly alternate that is an alternate that is less hazardous, Cd and hex-Cr free, and has superior performance over brush Cd.

Specifications Required: After the successful completion of this Phase II.5 Navy SBIR effort, a Letter of Authorization will be received in order to include this technology across the NAVAIR. ES3 will work with the Navy to transition and implement the brush plating process throughout NAVAIR and NAVSEA.

Technology Developed: Current repair techniques use Cadmium for brush repair applications. Brush Zn-Ni provides superior performance in all tested areas, particularly for corrosion prevention. The process improvement for complex geometry and inner diameter (ID) bore prototyping and process modeling, as well as plating by amperage versus voltage, is one of the many advantages and benefits for this technology. Plating by amperage provides better control for plating the deposit, as well as increased uniformity.

Warfighter Value: This technology increases the readiness and availability of all aircraft by providing an improved process and solution for brush Zn-Ni repairs. By replacing brush Cd with brush Zn-Ni, the repair and touch-up work on parts will be improved due to superior performance such as increased corrosion resistance, abrasion resistance, and reduced toxicity. Reduced hazardous waste generations of carcinogens results in cost savings as well. Additionally, there is improvement in ESOH conditions for technicians and shop personnel.

WHEN

Contract Number: N68335-22-C-0440 **Ending on:** Mar 14, 2024

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Develop NAVAIR Certification Protocol	Low	Spec is accepted by NAVAIR	5	2nd QTR FY23
Plate Test Assets	Low	All plating completed	5	1st QTR FY24
Testing	Low	All testing completed and passed requirements	7	2nd QTR FY24
Performance Optimization	Low	Optimization achieved and ready for the Option Period, leading to receiving a Letter of Authorization	7	2nd QTR FY24

HOW

Projected Business Model: ES3 has provided input to the customer for development of their Technology Transition Agreement (TTA) and Statement of work (SOW). ES3 worked with FRCSE customer to produce an integrated master schedule (IMS) that shows an 18-month base period and two (2) 18-month option periods that document schedule and tasks required to meet technical requirements identified by the customer as well as estimated costs to complete tasks. Upon completion, the Navy plans to begin the process of integrating the use of the technology.

Company Objectives: Initially, the target market for this technology will be NAVAIR, NAVSEA, FRCs, and other depots that are responsible for repairing worn or damaged surfaces of on any aircraft, ships, land vehicles platforms and/or ground support equipment with brush plating touch-ups. ES3 would like to meet with representatives to better understand their unique needs.

Potential Commercial Applications: ES3 is interested in any customer that has a serious interest in implementing the process into their facility, such as current industry collaboration with original equipment manufacturers (OEMs).
In addition to this transition, ES3 is concurrently working with National Defense Center for Energy & Environment (NDCEE) on a DLT System that is a tri-service effort, with a planned 2024 Dem/Val at FRCSE. In the future, ES3 plans to join this current solution and process with the DLT System.

Contact: Beth Randolph, Project Manager / Senior Chemist/Biologist
beth.randolph@es3inc.com (478) 324-1340