



Newport News
Shipbuilding

**National Shipbuilding Research Program (NSRP)
Surface Prep and Coatings (SP&C) Panel Project
Final Report – July 2011**

***A Study to Determine an Alternative
Coatings System Environmental Recorder***

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Introduction:

The National Shipbuilding Research Program (NSRP) is a collaboration of U.S. shipyards working together to reduce the cost of building, operating, and repairing Navy ships. The shipbuilding industry will achieve this by improving productivity and quality through advanced technology and processes. NSRP leverages public/private cooperation to manage cost-shared Research and Development (R&D) based on a consensus Strategic Investment Plan.

Newport News Shipbuilding (NNS) has a long history of working with NSRP and views its involvement with the Surface Preparation and Coatings (SP&C) Panel as an opportunity for continued growth. NNS' investment in the SP&C Panel pays dividends by allowing the Company to be on the forefront of issues, concerns, improvements, and innovations in the ever changing Coatings arena. The Company benefits from the vast array of information available to the Panel attendees and the opportunity of sharing knowledge with NNS' customers, suppliers, and industry partners. The Panel meetings serve to raise awareness, to exchange information, to look for new solutions, and to implement improvements. The Company's on-going involvement allows the Shipyard to be a part of the process that defines work, requirements, and practices impacting operational performance. NNS' role is not that of a sideline observer, but an active participant in shaping the SP&C industry. That active participation led to the submittal of "***A Study to Determine an Alternative Coatings System Environmental Recorder***" white paper, which ultimately became a 2010 approved and funded project.

Panel Project Solicitation and Selection:

The greatest portion of industry and government funding for NSRP is invested in R&D projects. Projects selected and executed fall into two categories: Panel Projects and Research Announcement (RA) Projects. Panel projects are lower cost and shorter duration (\$100K and 12 months or less). RA projects can run into the millions of dollars, funded with both government monies and industry cost share, and last up to three years. NNS' 2010 project fell into the category of \leq \$100K and \leq 12 months. The Executive Control Board (ECB) traditionally funds, on an annual basis, a portfolio of smaller-scope, shorter duration, less costly projects which are executed through the Panels in accordance with programmatic conditions. The proposal initial requirement for such projects is a brief "white paper" with summary cost information. A copy of NNS' actual "white paper" is enclosed within this document, see pages 4–6.

The ECB awards funding for Panel projects based on **value to the shipbuilding and repair industry, Navy, and other customers** according to the evaluation criteria. The solicitation for each cycle will be announced via email to the Panel Chairs and will indicate the due date for project requests. No formal Request for Quote (RFQ) will be issued. The proposed program funding amount must not exceed \$100K for any one project.

NNS' project was submitted during the 4Q09 in support of the SP&C's Panel Chair call for "white papers". The topic was chosen based on the upcoming work relative to CVN 71.

A Study to Determine an Alternative Coatings System Environmental Recorder “White Paper”

Proposer Identification:

October 9, 2009

Prepared By: Arcino Quiero, Jr. and Micah McCluer

Project Co-Leads: Arcino Quiero, Jr. and Darius Windley

Industry Involvement: Newport News Shipbuilding (NNS)

Concept Description:

To evaluate and recommend a reliable, efficient, and cost effective alternative Coatings System Environmental Recorder (i.e. Data Logger) in support of the Specification for Environmental and Surface Contact Temperature Record System. Develop new technology, if required, to meet projected long term needs.

Project Goals and Objectives:

Obtain an Environmental Recorder that will meet current requirements and potential future needs.

- Improve the reliability of environmental data in support of surface preparation and coatings.
- Reduce human intervention, thus increasing efficiency and reducing cost, in obtaining environmental data in support of surface preparation and coatings.
- Increase the Shipyards’ ability to share environmental data internally and externally (with various regulatory agencies and its customers).

Methods and Procedures Required for Accomplishing Goals and Objectives:

Establish the equivalency of the various commercially available data loggers. The NAVSEA Standard Item 009-32 (FY-11) currently recommends using the Veriteq Model No. KT-2000-NEI system or an equivalent. The Veriteq model can cost upwards of four (4) times the cost of other comparable units. If equipment can be obtained at a lower per unit cost that meets and/or exceeds the current requirement the associated savings, cost and schedule, can potentially be passed on to our customer.

Previous and Current Related Work:

Ultimately, it would be beneficial to Newport News Shipbuilding (NNS) and other Shipyards to have their own data logging network in place for all future contracts. With that goal in mind, a search began to obtain a Coating System Environmental Recorder that would meet NNS’ customer requirements while being readily adaptable for internal use. During that investigation, it was determined that “equivalency” of the alternate units would have to be established in order to meet the identified requirements. Please see the attached table (next page) for detail information obtained and utilized for the internal investigation.

Note:

The scope of this effort was limited to the four (4) manufacturers identified in the attached table and utilized during NNS’ internal investigation.

| Manufacturer | | Elcometer | Vireteg/Navy | Defelsko |
|---|-----------------------|--|---|---------------------------------------|
| Model/Equipment | | G319---T Dewpoint Meter w/Elcomaster Data Management Software | KT-2000-NEI | Posi-Tector DPM w/Surface Temp Kit |
| Data Collected | %RH | Y | Y | Y |
| | T _{SURFACE} | Y | Y | Y |
| | T _{AMBIENT} | Y | Y | Y |
| | T _{DEWPOINT} | Y | Y | Y |
| | T _Δ | Y: (T _D -T _S) | | Y: (T _D -T _S) |
| | T _{DRY BULB} | Y | | |
| | T _{WET BULB} | Calculated | | |
| Accuracy | | | | |
| T _{SURFACE} | -4 to 175 F | ±1°F | ±0.27°F | ±1°F |
| T _{AMBIENT} | -4 to 175 F | ±1°F | ±0.27°F | ±1°F |
| %RH | 0 to 100% | ±3% | ±2% | ±3% |
| Data Collected via How the sensors are transmitting the data out of the space to the "box" | | | | |
| Wired | | Y | Y | |
| Wireless | | | | |
| In Real Time? | | Y | | |
| Data Transmitted via How the "box" is transmitting the data to the network | | | | |
| Wired | | USB | N/A (See Comments) | |
| Wireless | | Bluetooth | | |
| In Real Time? | | Y | | |
| Alert Method How the cognizant parties will be automatically notified of a problem | | | | |
| Phone Call | | | N/A | |
| Text Message | | | | |
| On Screen | | X | | |
| Firewall | | Inside | Inside | |
| Support | | Free Phone Support M-F during business hours (Eastern Time) but other arrangements can be made | Free Phone Support M-F during business hours (Pacific Time) but other arrangements can be made at additional cost | |
| Lead Time | | 4 wks | 6 weeks | |
| Power Supply | | 2 AA batteries or via USB Cable | Batteries | |
| Battery Life | | Manual: 40 hrs (backlight off). Logging: ~400 hrs (1 every 10 minutes) | last 1 month | |
| Cost | | Unit reads everything but Surface Temp. Surface Temp requires probe. | \$3730 for Starter Kit. \$1260 for ambient temp & humidity. \$945 for surface temp. | |
| Monitoring Unit | | \$799 | N/A | |
| Probe(s) | | \$130 | N/A | |
| Calibration | | Can be calibrated here or sent to Elcometer. Quick Turn around | Can be calibrated here or sent to Veriteq. Rather lengthy turn around. | |
| Comments/Special Features | | Will provide onsite training on use. | Data can be viewed at the location in real time with a hand-held device or downloaded and viewed on an office pc | |

Deliverables:

The outcome of this investigation will be a statement of the relative equivalency of the various commercially available environmental monitoring equipment/systems with data logging capabilities.

Benefits and Return on Investment (ROI):

Should the investigation reveal a less expensive product that can provide qualitative and quantitative data that meets and/or exceeds the required specification Newport News Shipbuilding can potentially pass those savings on to its customer. Should this analysis not disclose an equivalent system, the information obtained during the initial research can be utilized in the development of an actual system that would meet and/or exceed the current requirements.

Technology Transfer Approach:

The results of this study will be eagerly anticipated by the Surface Preparation and Coatings industry at large because of the system efficiency and the cost differential to the current system. The results of this study will be made available to interested parties through the following potential means:

- NSRP Surface Prep and Coatings (SP-3) panel meetings.
- NSRP Surface Prep and Coatings (SP-3) website.
- Training on new process and/or equipment will be offered to key stakeholders.

Expected Duration:

December 2009 through May 2010 or 12 months from funding.

Program Funds:

| Program Funds | | |
|--------------------------------|--|------------------|
| Type | Description | Amount |
| Labor - Engineering | 410 hours at \$102.00/hour | \$ 41,820 |
| Labor - Production | 140 hours at \$72.00/hour | \$ 10,080 |
| Travel | 3 report trips to NSRP at \$2000/trip/person | \$ 6,000 |
| Subcontractors/ Consultants | | \$ - |
| Material/ Equipment | Production equipment from various suppliers | \$ 32,500 |
| Material/ Equipment | Support/test equipment | \$ 2,000 |
| Other Direct Costs | | \$ - |
| Indirect Costs | | \$ - |
| | Total Program Funds | \$ 92,400 |
| Cost Share | | |
| Type | Description | Amount |
| | None | \$ - |
| | Total Cost Share | \$ - |

Cost Share: N/A

Weighting Factor: N/A

Submission Process:

NNS' "white paper" was forwarded to the SP&C Panel Chair in accordance with the Panel Project Guidelines. NNS' "white paper" was then added to the overall list of Panel projects. The Panel's Chair and Members then conducted an internal review and ranking of all the white papers submitted based on "best value". The Panel Chair then presented the top three (3) "white papers", which included NNS' submittal, with the required documentation detailing ranking and Shipyard support directly to the NSRP ECB. The "white papers" contained sufficient information that aided in facilitating the ECB decision-making process, meeting their accountability to Naval Sea Systems Command (NAVSEA), and responsibility for sound resource allocation. Submissions also included a completed and signed cover letter and supporting cost data.

Review:

In addition to the internal panel review, once the Panel Chairs had submitted their prioritized white papers, an additional review was conducted by the NSRP Executive Director's staff to identify and resolve any technical and/or cost issues which might prevent full consideration. This review is typically conducted at least four (4) weeks prior to the ECB Project Selection Meeting to allow sufficient time for full review, to outline issues for Panel Chairs to answer, for Panel Chairs to develop responses, and to prepare for the Project Selection Meeting.

Selection and Award:

Three (3) SP&C compliant white papers were presented to the Executive Control Board. **All three of the SP&C Panel Projects presented were approved and received funding for 2010.** The ECB decisions for approval were based on a "best value" weighed against its accountability to the government. The evaluation criteria use by the ECB was as follow:

- Proposal addresses topics covered in the Strategic Investment Plan
- Project results can be implemented, if applicable, and provide benefit to the industry and the Navy
- Sound implementation plan
- Strong business case, reasonable proposed costs

The attached PDF file contains a copy of the **NSRP Task Order (#18) Agreement 2005-341**. This agreement outlined the cost (**\$78,322**) and timeframe (**May 5, 2010–May 5, 2011**) for completing the approved project. The attached PDF file also contains a copy of the project's **Statement of Work (SOW)**.

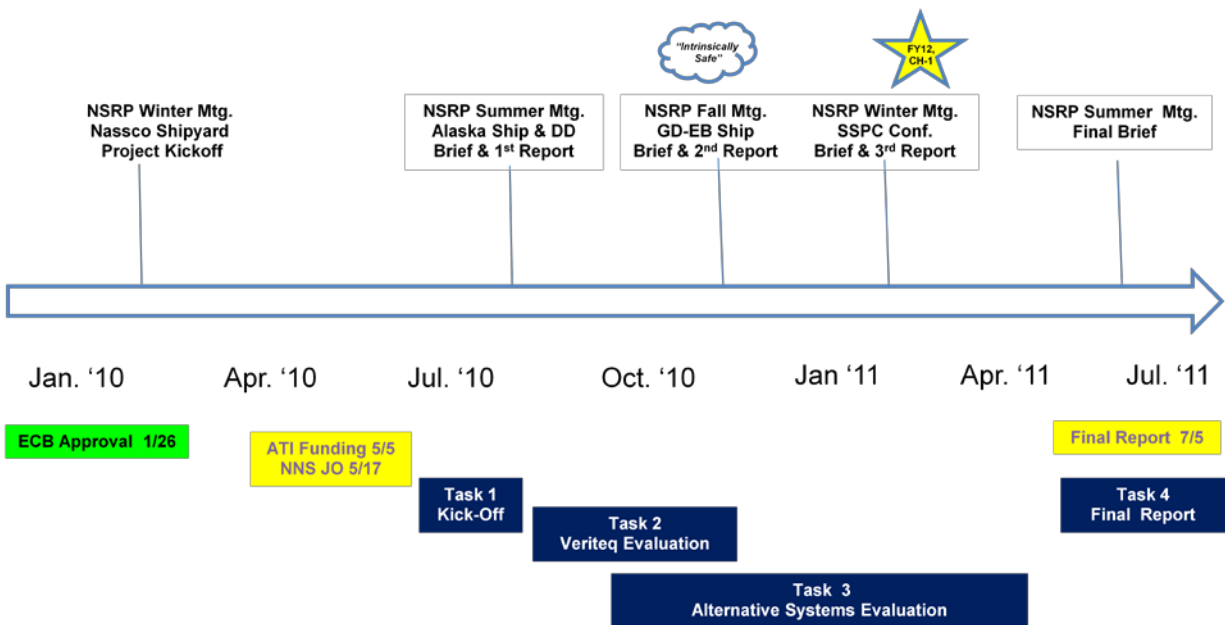


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Funding Approval:

The ECB approved NNS’ project submittal on **January 26, 2010**. Contracts and Pricing (O19) worked with Advanced Technology Institute (ATI), the contracting agent for NSRP, to finalize the agreement. The Project Lead received a funded project of \$78,322 (\$7,084 of which was fixed fee). This effort resulted in a funding reduction of 15% from the original estimate. The letter of agreement from ATI, **Task Order #18**, was provided to NNS on **May 5th** and a **Job Order** was provided to the Project Lead on **May 17th**. The assigning of a Job Order is NNS’ signal of clearance for the actual start of work. See NNS’ Plan of Actions and Milestones (POA&M) below for a visual representation of overall project tasks.

**Alternative Coatings System Environmental Recorder
Plan of Action and Milestones (POA&M)**



Project Communication, Oversight, and Reporting Requirements:

ATI is tasked to work with the Project Lead to ensure progress of the approved projects. Additionally each Project is assigned a Project Technical Representative (PTR). The PTR is typically a subject matter expert with extensive experience in the shipbuilding industry, who will provide third-party oversight of the terms of the agreement. The PTR also verifies that the technical information presented is accurate, and ensures satisfactory progress is made throughout the period of performance. Mike Ferrell, Paint General Foreman, Bath Iron Works, agreed to serve as NNS’s PTR. Other requirements included updates presented to NSRP SP&C Panel and to quarterly Project Briefs and Status Reports to ATI. See July 5th Panel Project Status Report below.

Panel Project Status Report – July 5, 2011:

Technical Status

Technical Progress / Major Accomplishments:

- ✓ Verified the advantages of an electronic system as oppose to a manual system.
- ✓ Conducted reviews of the various Environmental System Records (Data Loggers) to determine which systems could be utilized during the alternative study.
- ✓ Established an approach and deployment for use of Data Loggers.
- ✓ Kicked off field study in coatings storage area.
- ✓ Obtained and down loaded data to a non-network computer.
- ✓ Provided a “first look” of the 2010 funded project at the NSRP SP&C Panel Winter meeting in San Diego (February 2010).
- ✓ Presented the 2010 funded project status updates at the NSRP SP&C Panel Summer meeting in Ketchikan, AK (August 2010), Fall meeting in Providence, RI (November 2010), and Winter meeting in Las Vegas, NV (February 2011).
- ✓ **Veriteq’s Data Logger (Model No. KT-2000-NEI) is no longer being certified as “Intrinsically Safe” by the manufacturer.**
- ✓ **NAVSEA Standard Item 009-32 (FY-12, CH-1) reads “the preferred method of measurement is use of a Data Logger”.**
- ✓ Presented the 2010 funded project **final** update at the NSRP SP&C Panel Summer meeting in Marinette, WI (June 2011)

Progress against Schedule

Problems / Issues:

The project Plan of Action and Milestones (POA&M) has been updated to reflect the impact of the three month funding delay. It is anticipated that the project will be completed within the 12 month duration allowed. The project estimated completion date (ECD) is May 2011 as indicated in the NSRP Task Order (#18) Agreement 2005-341. A final report was presented at SP&C Panel Summer meeting, June 21, 2011 in Marinette, WI. The ECB voted to approve a no-cost extension for the Alternative Coating Recorder project. The period of performance for the project has been extended to July 5, 2011.

Utilizing Data Loggers in a production environment has proven to be challenging. Some of the issues encountered are the protection of the equipment during actual production, unauthorized relocation of equipment, and the lack of the ability to calibrate the equipment on site.

Recent / Near-Term Events:

- ✓ January 26th – Received project approval from NSRP Executive Control Board (ECB).
- ✓ February 26th – Presented the project “First Look” to NSRP SP&C Panel during Winter meeting in San Diego, CA.
- ✓ July 8th – Kicked off the project with the internal working team.
- ✓ July 26th – Ordered equipment from various (three) Suppliers.
- ✓ August 12th – Received equipment from various Suppliers.
- ✓ August 13th – Submitted initial Project Status Report to Advance Technology Institute (ATI).
- ✓ August 24th – Provided update to SP&C Panel during Summer meeting in Ketchikan, AK.
- ✓ November 3rd – Provided update to SP&C Panel during Fall meeting in Providence, RI.

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- ✓ November 24th – Submitted 2nd Panel Project Status Report to Advance Technology Institute (ATI). Contacted ATI prior to actual due date and informed them that the report would be a week late. Key driver in delayed submittal was due to competing demands on limited resources.
- ✓ February 3rd – Provided update to SP&C Panel during Winter meeting in Las Vegas, NV.
- ✓ February 15th – Submitted 3rd Project Status Report to Advance Technology Institute (ATI).
- ✓ June 21st – Provided final update to SP&C Panel during Summer meeting in Marinette, WI.
- ✓ May 26th – Project given a no-cost extension through July 5th.
- ✓ July 5th – Submitted final Project Status Report to Advance Technology Institute (ATI)

Business Status

Problems / Issues:

The project was originally funded for \$92,400. After the project was re-scoped by NNS Contracts and Pricing (O19), the requested funding for this effort was reduced to \$78,322. The new funded amount included a \$7,084 fixed fee. The reduction in funding is largely reflected in the funds allocated for equipment (\$32,000 verse \$7,000) and the fixed fee, which was not captured in the original estimate.

| Description of task | Allocation | Project Expenses |
|------------------------------------|-----------------|------------------|
| Original Project Allocation | \$92,400 | |
| Revised Project Allocation | 78,322 | |
| Fixed Fee Cost (9.0%) | | \$ 7,084 |
| Labor | | 15,845 |
| Incurred Material | | 15,146 |
| Booked Overhead | | 19,767 |
| Total Commitment | | \$57,842 |
| Cost Percent Spent | 74% | |

Significant Events Relative to Business Status:

- ✓ February 26th – Funding not available in time to support NSRP SP&T Panel Winter meeting (\$1,500 for travel plus labor).
- ✓ March 1st – Anticipated funding release from Advance Technology Institute (ATI).
- ✓ May 5th – Obtained funding from ATI, approximately three month delay.
- ✓ May 12th – Obtained actual funding (job order) from NGSB-NN Contract and Pricing (O19).
- ✓ May 17th – Provided job order (for charging purposes) and project guidance from O19.
- ✓ August 28th – Material and labor cost to support the Panel’s Summer meeting represented ~ 15% of the project funding.
- Spending behind schedule but anticipated to pick during the next few months.

Project Implementation:

“A Study to Determine an Alternative Coatings System Environmental Recorder” kick-off was held on July 8, 2010. Representatives from the Carrier Overhaul Program, Coatings Technology & Material Engineering, Manufacturing Engineering, and Quality & Process Excellence attended the initial meeting. The purpose of that meeting was to lay the foundation for the project, gain everyone’s buy-in, and ensure a common understanding of the overall effort. The attached slide provided a summary of the project including the objective, goals, deliverables, as well as the funding and time frame for implementation. Additionally, the project’s Statement of Work (SOW) and Plan of Action and Milestones (POA&M) was shared with the Team to provide greater insight into the project.

Alternative Coatings System Environmental Recorder

| Project Information as of 1/2010 | Purpose / Objective |
|---|---|
| <p>Prime / Lead: Newport News Shipbuilding (NNS) – Formally NGSB-NN</p> <p>Duration: 12 months – (Funding approved and authorized May 17, '10)</p> | <p>To evaluate relative equivalency of various commercially available equipment and to recommend a reliable, efficient, and cost effective Alternative Coatings System Environmental Recorder (i.e. Data Logger).</p> |
| Goals / Deliverables | Financial Information |
| <ul style="list-style-type: none"> • Increase reliability of environmental data • Reduce human intervention in obtaining environmental data • Increase the Shipyards’ ability to retain and share environmental data • Equivalent/superior environmental recorder • More cost effective environmental recorder | <p>Program Funds: \$92,400</p> <p>Revised Funds: \$78,233</p> <p>Cost Share: \$0</p> |

That SOW, or detailed project plan, provided the Team a road map for success. Success relative to this effort is defined as the identification of equivalent (reliable, efficient, and cost effective) Data Logger. A Data Logger that meets and/or exceeds the requirements of NAVSEA Standard Item 009-32 (FY-11). Success is further defined as a change to NAVSEA Standard Item 009-32 to allow for the use of an equivalent Data Logger. The tasks, as outlined in the SOW are as followed:

Task 1 – Examination of Environmental Requirements (NAVSEA Standard Item 009-32 (FY-11)):

The Team took a critical look at the environmental requirements (NAVSEA Standard Item 009-32 FY-11)) to gain a better understanding of them and to ensure that the Shipyard was interpreting them consistently across the Carrier Overhaul Program. Over the past few years the Navy has continued to relax the requirements for obtaining environmental readings while utilizing Data Loggers, with 009-32 FY-12 (CH-1) calling for manual readings to be taken every 24 hours and Data Logger’s sample rate set at one (1) hour intervals.

The NAVSEA 05 Paint Warrant Officer stressed the need to look at the “Intrinsically Safe” aspect of the requirements. At the time of the project kick-off 009-32 (FY-11) required that Data Loggers be “Intrinsically Safe”. Veriteq was the only manufacturer producing an “Intrinsically Safe” device. The Team initially looked at the difference between “Intrinsically Safe” and “Explosion Proof” and made the argument for utilizing an “Explosion Proof” device if all else was equal. This position was not well received. See appendix 4, final project out brief for additional information. **Later during the study the Team discovered that Veriteq stopped producing an “Intrinsically Safe” device and shared that information with the SP&C Panel during its’ winter meeting, which was held in conjunction with the Society for Protective Coatings (SSPC). This immediately led to a lively discussion and later a change to NAVSEA Standard Item 009-32 (FY-12 CH-1)). The Standard now reads “the preferred method of measurement is use of a data logger”. This change marked a WIN for this project and better yet a WIN for the Coatings Community.**

Task 2 – Evaluate the Current Recommended System (Veriteq KT-2000-NEI):

The evaluation of the Veriteq system revealed that it was reliable and it could take the stress of long term use in a production environment. It was the required system so it was always anticipated that it would be a good unit. The accompanying software allowed for the capture, storage, and later retrieval of data. It allowed for the reliable collection of data over time. The only question going in was one of total value. The Veriteq system is several times more expensive than the other systems tested.

Task 3 – Evaluate and Determine Alternative (Equivalent) System:

There were several other systems (three total) tested over the life of this project. See the final our brief attached for a detail list of manufacturers, their capabilities, accuracy and costs. Two of the systems (Elcometer and DeFelsko) tested during this project proved to show a great deal of promise. The final out brief highlights the systems and their overall total value. There was an additional study conducted internal to NNS relative to the use of Data Loggers independent of this project. Several systems were tested with mixed results. This Team will continue to follow up on that effort and communicate its outcomes as appropriate. The attached PDF file also contains a copy of the final out brief presented at the NSRP SP&C Panel summer meeting in Marinette, WI on June 21, 2011.



Alternative Coatings
System Environmenta

Task 4 – Final Report:

The SOW indicated that the final report at a minimum would consist of the project objectives, progress made against those objectives, project results, benefits of those results, conclusions, and final recommendations.

Project Objectives – Over the life of this project the Team has addressed each of the items above. The objective of the project is clearly stated in the original “white paper”, the SOW, and the final out brief provided to the NSRP Panel during the summer meeting in Marinette, WI on June 21, 2011 and within this document.

Progress Made Against Objectives – The progress made against those objectives; improving the reliability of environmental data, reducing human intervention in obtaining environmental data, and

increasing the Shipyard's ability to retain and share environmental data, has been highlighted throughout this document. The use of Data Loggers allows Shipyards to obtain environmental data in a systematic method. The Data Loggers are programmed to take environmental readings, to storage information, and to allow for its retrieval as required. All of this is done without the intervention of personnel (i.e. humans) and/or the need to have personnel available on unmanned shifts. The use of Data Loggers and its associated software increase the Shipyards ability to manage its overall data.

Project Results and Benefits – This project has resulted in the identification of several alternatives to the Veriteq Data Logger for monitoring environmental during production. All of these alternatives are less expensive than the previously required Veriteq system resulting in reduction in total production costs. Additionally, it has resulted in a change in NAVSEA Standard Item 009-32 to allow for the use of any Data Logger meeting the technical requirements of the 009-32. The use of Data Loggers support minimizing and/or eliminating handling documents manually, which further supports a paperless environment and “paperless QA”.

Conclusions – Key Takeaways of this project are highlighted in the slide below.

- NAVSEA Standard Item 009-32 (FY-12, CH-1) adopted the use of a Data Logger for obtaining environmental readings.
- Veriteq no longer manufactures an “Intrinsically Safe” Data Logger.
- Several manufactures produce “An Alternative Environmental Coatings System Recorder” which meets NAVSEA's requirements and ship's needs.
- Many of the current models support the evolution of paperless QA

Final Recommendations – the recommendations that follow are provided from a process and project perspective.

- Submit your project “white paper” early within the process to ensure time for the SP&C Panel to review and provide feedback in a timely manner.
- Ensure that your project has been approved by your own organization prior to submittal. This should include a cost estimate review by Contracts and Pricing (O19) in NNS' case.
- Gain true internal support from your own organization and other Shipyards prior to submittal. This will ensure buy-in on your end and the availability of resources to support the project within the SP&C Community.
- Seek a Mentor to guide and support you through the process. The administrative portion of this process is well documented by NSRP side, but may not be as well defined internally.