Newport News Shipbuilding
A Division of Huntington Ingalls Industries

A Study to Determine an Alternative Coatings System Environmental Recorder

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Alternative Coatings System Environmental Recorder

Project Information as of 1/2010	Purpose / Objective
Prime / Lead: Newport News Shipbuilding (NNS) – Formally NGSB-NN **Duration**: 12 months – (Funding approved and authorized May 17, '10)	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).
Goals / Deliverables	**Financial Information**
• 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	**Program Funds**: $92,400 **Revised Funds**: $78,233 **Cost Share**: $0

Alternative Coatings System Environmental Recorder

Statement of Work (SOW) – The purpose of this project is to evaluate the relative equivalency of commercially available equipment and recommend a reliable, efficient, and cost effective Alternative Coatings System Environmental Recorder (i.e. Data Logger)

✓Task 1	Evaluate environmental requirements (NAVSEA Standard Item 009-32) – Ensure to address “Intrinsically Safe” issue
✓Task 2	Evaluate the current recommended system (Veriteq KT-2000-NEI)
✓Task 3	Evaluate and determine alternative (“equivalent”) systems – Evaluated four models as part of the study
❖Task 4	Recommend potential alternative systems

Alternative Coatings System Environmental Recorder

NAVSEA Standard Item 009-32 – Environmental Readings

009-32 Revision	Manual Reading	Logger Sample Rate
FY06 Change 2	8 hrs	5 min
FY07	8 hrs	5 min
FY07 Change 1	8 hrs	5 min
FY07 Change 2	12 hrs	5 min
FY08	12 hrs	5 min
FY08 Change 1	12 hrs	5 min
FY09	12 hrs	5 min
FY09 Change 1	12 hrs	5 min
FY09 Change 2	12 hrs	5 min
FY09 Change 3	12 hrs	5 min
FY10	12 hrs	5 min
FY10 Change 1	12 hrs	5 min
FY11	24 hrs	1 hr
FY12 Change 1	24 hrs	1 hr

Note: For areas where a data logger is not used, environmental readings shall be manually taken every 4 hours and at every evolution involving (G) – points.

Alternative Coatings System Environmental Recorder

2009 NAVSEA Standard Specification for Ship Repair and Alteration Committee (SSRAC)

- Problem – Current standard reads: “Veriteq Instruments, Inc., Model No. KT-2000-NEI or equivalent”
- Proposed Change – Veriteq Instruments, Inc., Model No. KT-2000-NEI or equivalent logging device ***with the exception of “intrinsically safe” if approved for use by the safety officer.***
- Change Major √ Minor
- Cost Impact √ Yes No

Not Adopted

NAVSEA Standard Item 009-32
FY12 Change 1

- The preferred method of measurement is **use of** a data logger. If a data logger is used, it shall collect data at a minimum of every one (1) hour. To confirm data loggers readings, a manual reading shall be taken once every 24 hours and at every evolution involving (G) – points. Manual readings shall be documented on QA Checklist.
- For areas where a data logger is not used, environmental readings shall be manually taken every four (4) hours and at every evolution involving (G) – points. Readings shall be documented on QA Checklist.

Adopted 1/31/11

Alternative Coatings System Environmental Recorder

If a device is made safe for flammable environment, it can be either "intrinsically safe" or "explosion proof."

- "***Intrinsically safe***" – is designed to be certified by an independent approving body, so that if it fails during normal use and operation it will not generate enough energy to ignite a flammable mixture of the hazard classes specified.
  - **Class I** – locations may have ***flammable gases or vapors*** present in quantities sufficient for a fire or explosion.
  - **Class II** – locations where ***combustible dusts*** are not normally suspended in air or normal operations do not put dusts into suspension.
  - **Class III** – locations which are flammable, due to the presence of easily ***ignitable fibers***, but the fibers are not likely to be suspended in the air in quantities sufficient to produce an ignitable mixture.

- "***Explosion-Proof***" – is designed so that if a flammable mixture inside of the device ignites, the flame will not get outside of the device to ignite a flammable mixture outside of it.

Alternative Coatings System Environmental Recorder

"While an "intrinsically safe" device would meet the safety requirements of OSHA regulations, the National Electric Code, and U.S. Navy documents (including NSTM and Standard Items), it does not appear to be the ***only*** means of meeting these requirements. If the Data Loggers chosen comply with the safety requirements of these references and have the technical capabilities of the Veriteq KT-2000-NEI product, they should be considered equivalent."

J. Peter Ault, P.E., Elzly Technology Corporation

NSRP SP&C Panel Member, 3Q10

Manufacturer Equipment / Mode

Veriteq KT-2000-NEI	Elcometer G319	DeFelsko / PosiTector	ExTech 42280
Ambient Temperature: Y Surface Temperature: Y Relative Humidity: Y Dewpoint: Y	Ambient Temperature: Y Surface Temperature: Y Relative Humidity: Y Dewpoint: Y	Ambient Temperature: Y Surface Temperature: Y Relative Humidity: Y Dewpoint: Y	Ambient Temperature: Y Surface Temperature: N Relative Humidity: Y Dewpoint: Y
Ambient Temp:-+/- .27 F Surface Temp.: +/- . 27 F Relative Humidity: +/-2%	Ambient Temp:-+/- 1 F Surface Temp.: +/- 1 F Relative Humidity: +/-3%	Ambient Temp:-+/- 1 F Surface Temp.: +/- 1 F Relative Humidity: +/-3%	Ambient Temp:-+/- 1 F Surface Temp.: N/A Relative Humidity: +/-3%
Power Supply: Batteries	Power Supply: 2 AA batteries or via USB Cable	Power Supply: 3 AAA batteries, AC power cable	Power Supply: 4 AA batteries, AC power cable
Battery Life: 10 years (estimate)	Battery life: 40 hrs (backlight off), Logging: ~ 400 hrs (1 every 10 minutes)	Battery life: 50 hours (estimate)	Battery life: 3 months (estimate)
Calibration: Calibrated in house or sent to Veritwq. Lengthy turn around	Calibration: Calibrated in house or sent to Elcometer. Quick turn around	Calibration: Calibrated by manufacturer only.	Calibration: Calibrated in house. Requires calibration kit: RH300-CAL.
Cost: Starter Kit - $3,730 Amb. Temp / Humidity – $1,260 Surface Temp. - $945 Total: $5,935	Cost: Monitoring Unit – $799 Probe (s) – $130 Total : $929	Cost: Monitoring Unit – $675 Probe (s) – $395 Total: $1,070	Cost: Monitoring Unit – $199 Probe (s) – $49 Total : $248

Technical Approach

- To get an accurate account of how well data from the various data loggers correlate, units were placed in various areas; including paint storage, production facilities, and shipboard spaces.

- Parameter Set-Up
  - Dataset included: Relative Humidity, Air and Dewpoint Temperatures
  - Limits: Relative Humidity: 50-85% and Temperature: 60-85 F
  - One dataset recorded every hour

- Battery life – Initial status is checked every two days. Data may be lost or corrupted if level is too low. Therefore, batteries will be changed when units indicate 25% life remaining.

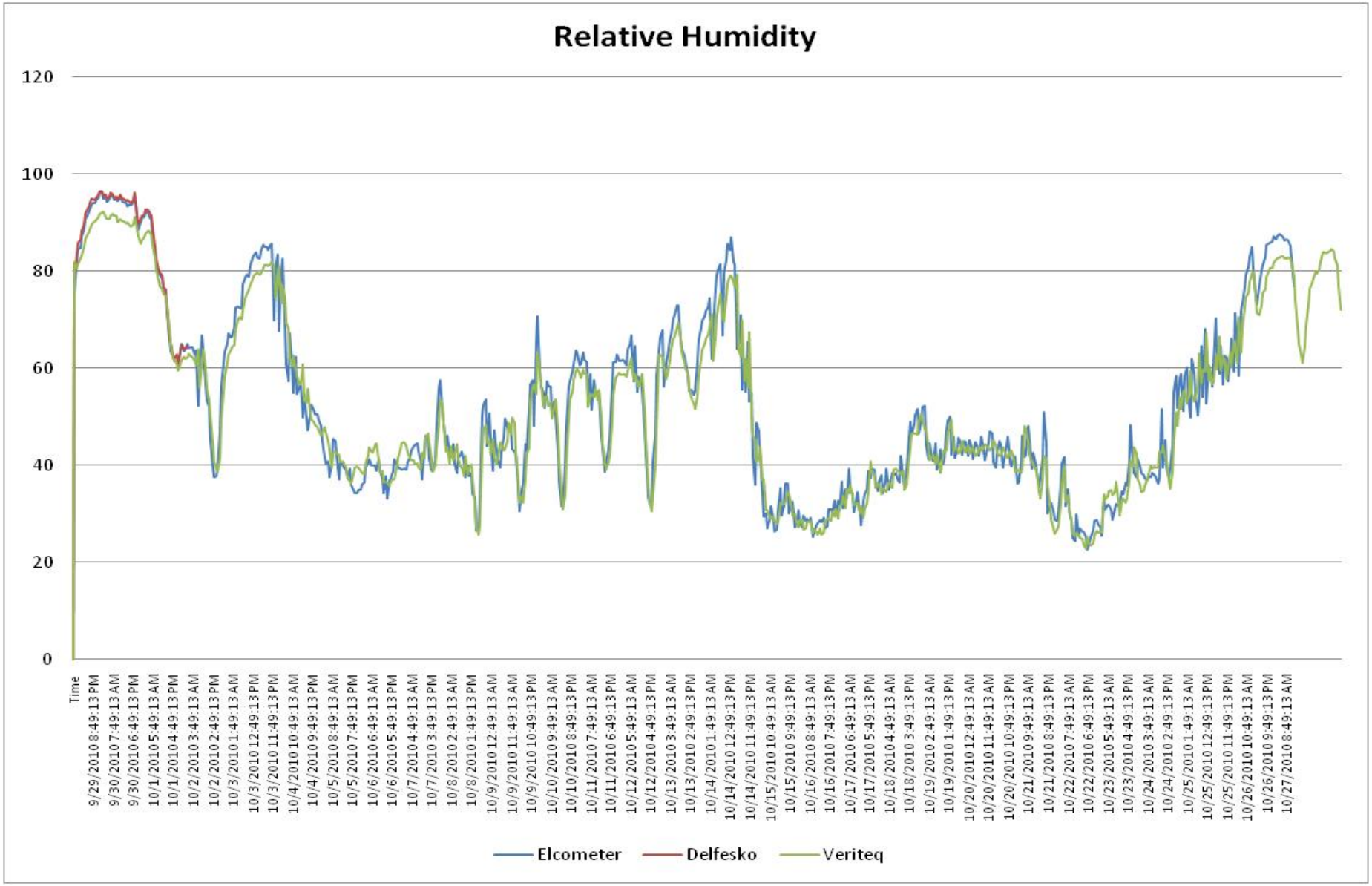
- Data Recovery – Each system has software that is used to download recorded data. When the data collection cycle was complete, information was downloaded to a non-network PC. Data was then charted to determine how well the different systems correlated.

Environmental Data Loggers Typical Setup

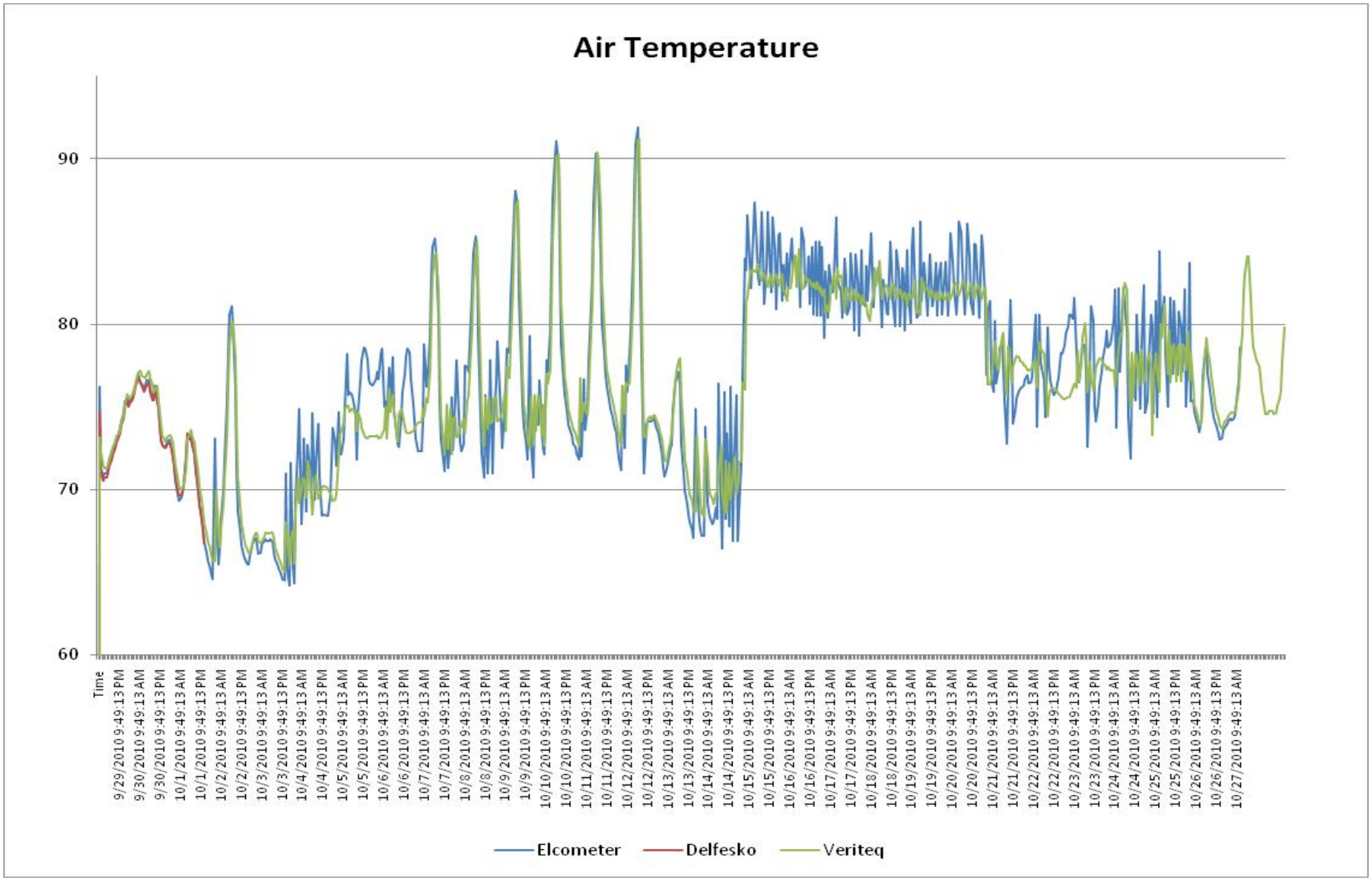
The data loggers selected for this investigation are the Veriteq KT-2000-NEI, Elcometer G-319, DeFelsko Posi-Tector DPM and the Extech 42280 (not pictured).

- The units were set up in various areas, including paint storage, paint production facilities, and shipboard spaces.
- Each unit was set up to record Relative Humidity, Air and Dew Point Temperatures.
- Pictured is the typical setup of how units were arranged in these work spaces.

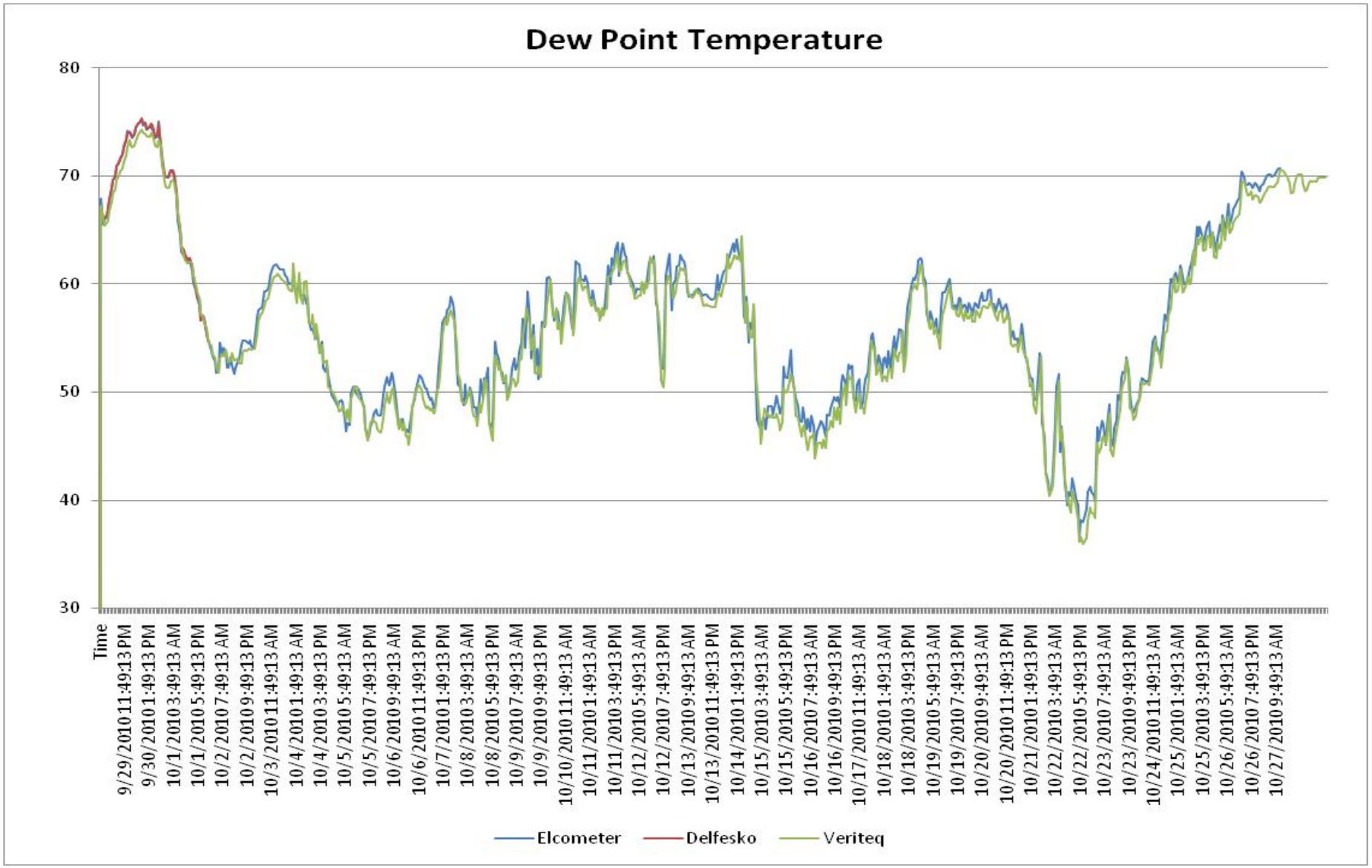
Relative Humidity – Paint Storage



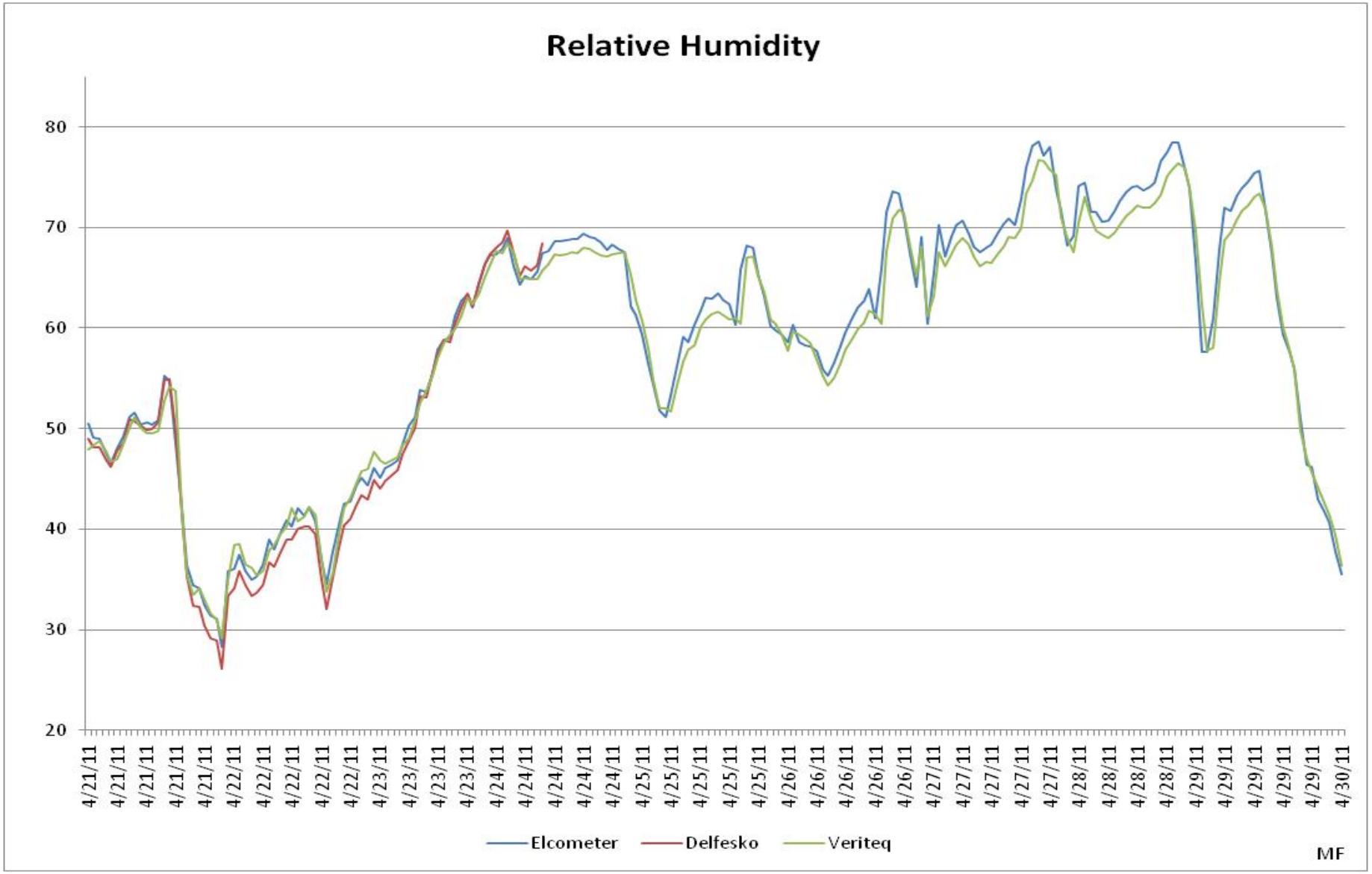
Air Temperature – Paint Storage



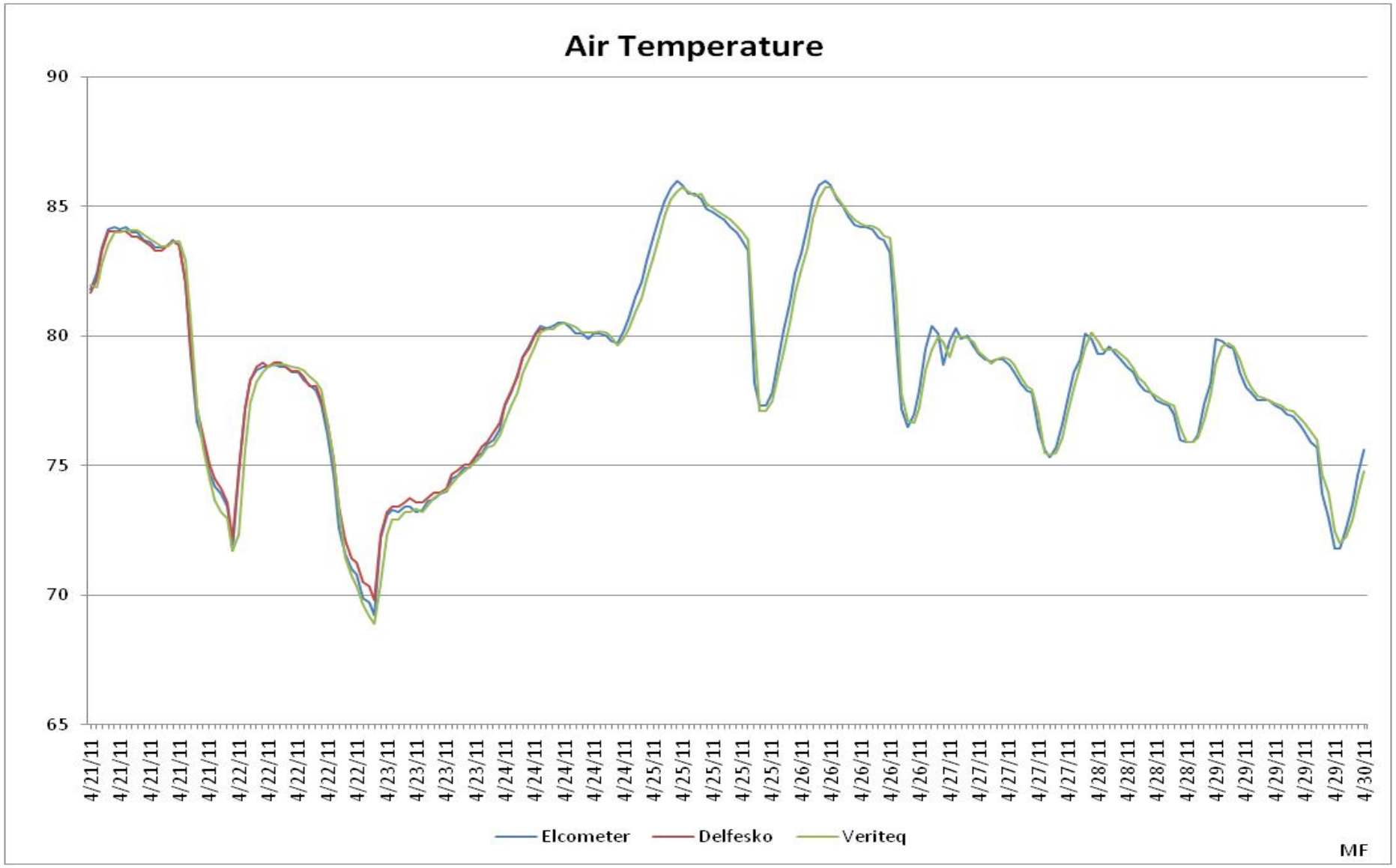
Dew Point Temperature – Paint Storage



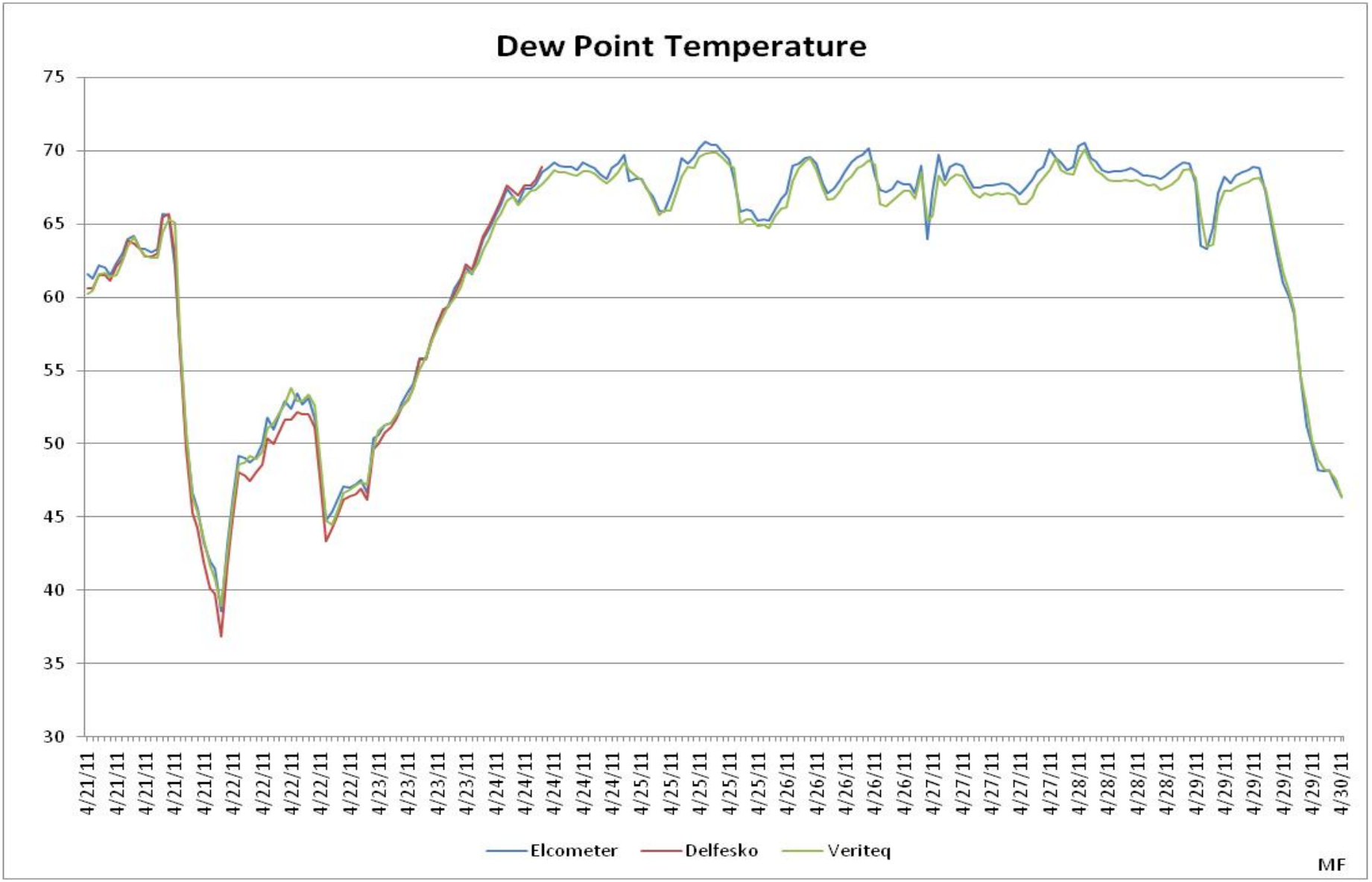
Relative Humidity– Metal Finishing



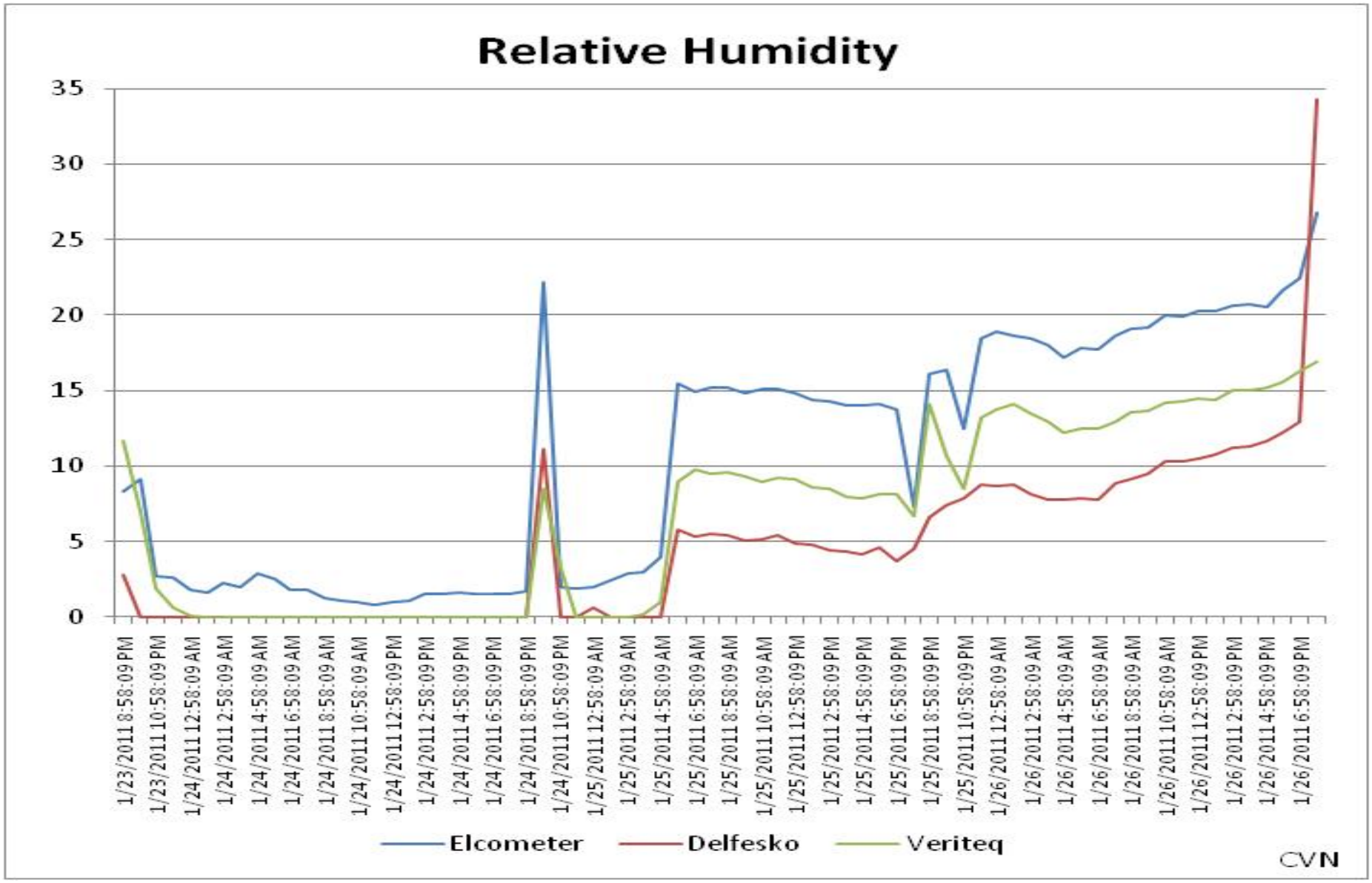
Air Temperature – Metal Finishing



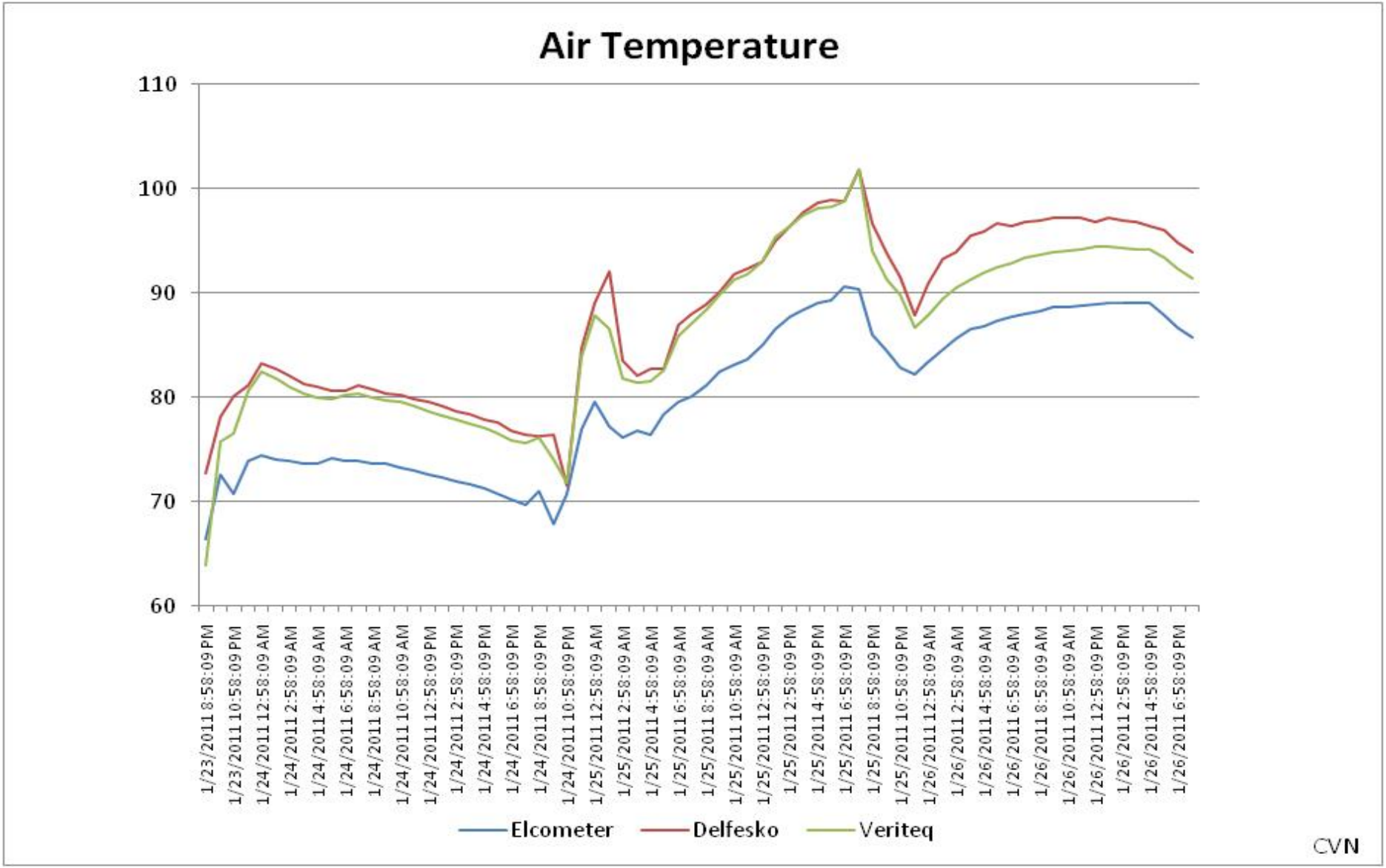
Dew Point Temperature – Metal Finishing



Relative Humidity – Ship Space

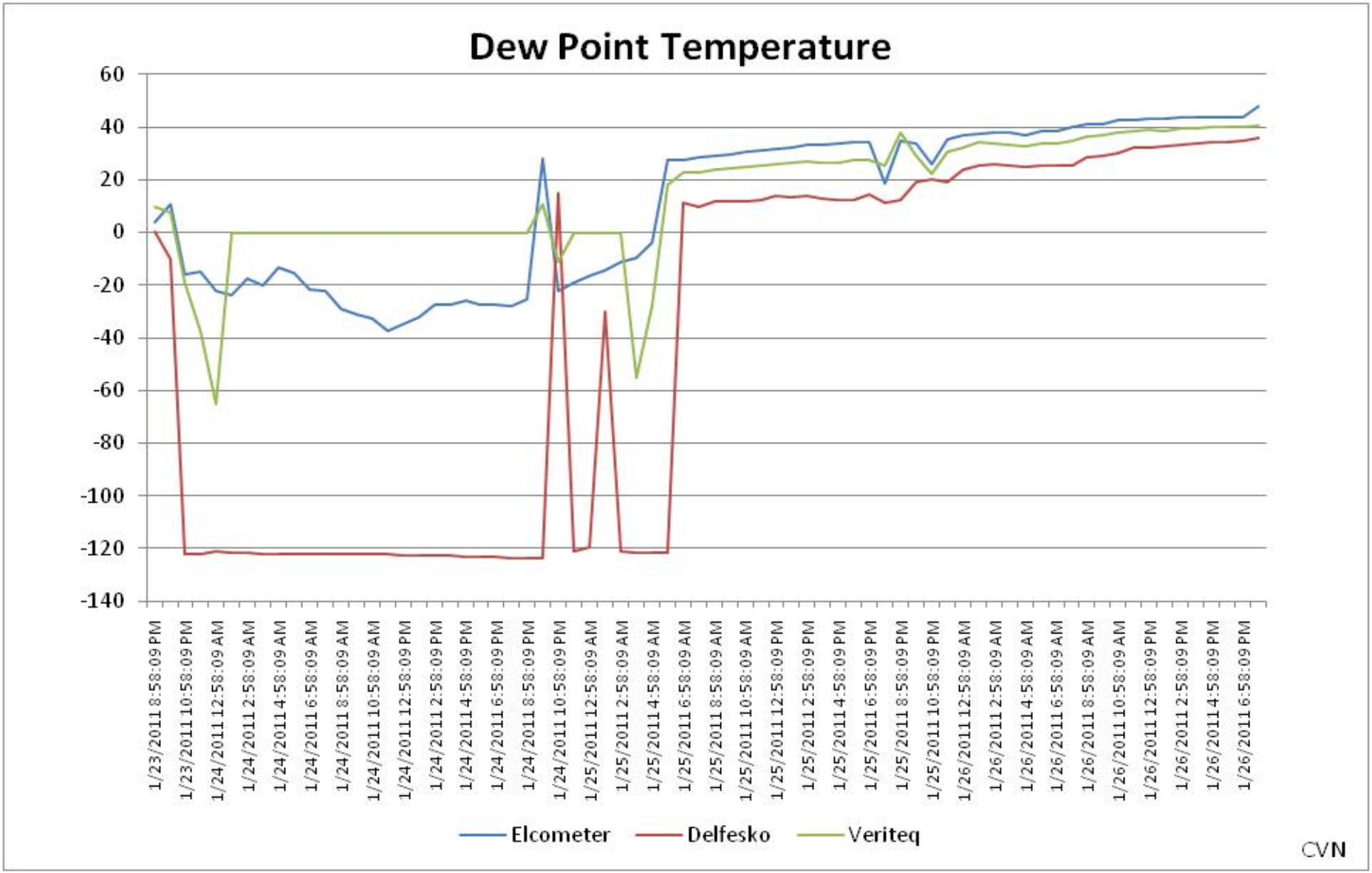


Air Temperature – Ship Space



CVN

Dew Point Temperature – Ship Space



CVN

Findings

- ExTech does not have sleep mode. This allows the unit to turn on when acquiring data and shut off when complete. Therefore battery life is very short (~ 2 days). As a result, it was decided to exclude this unit from the study.

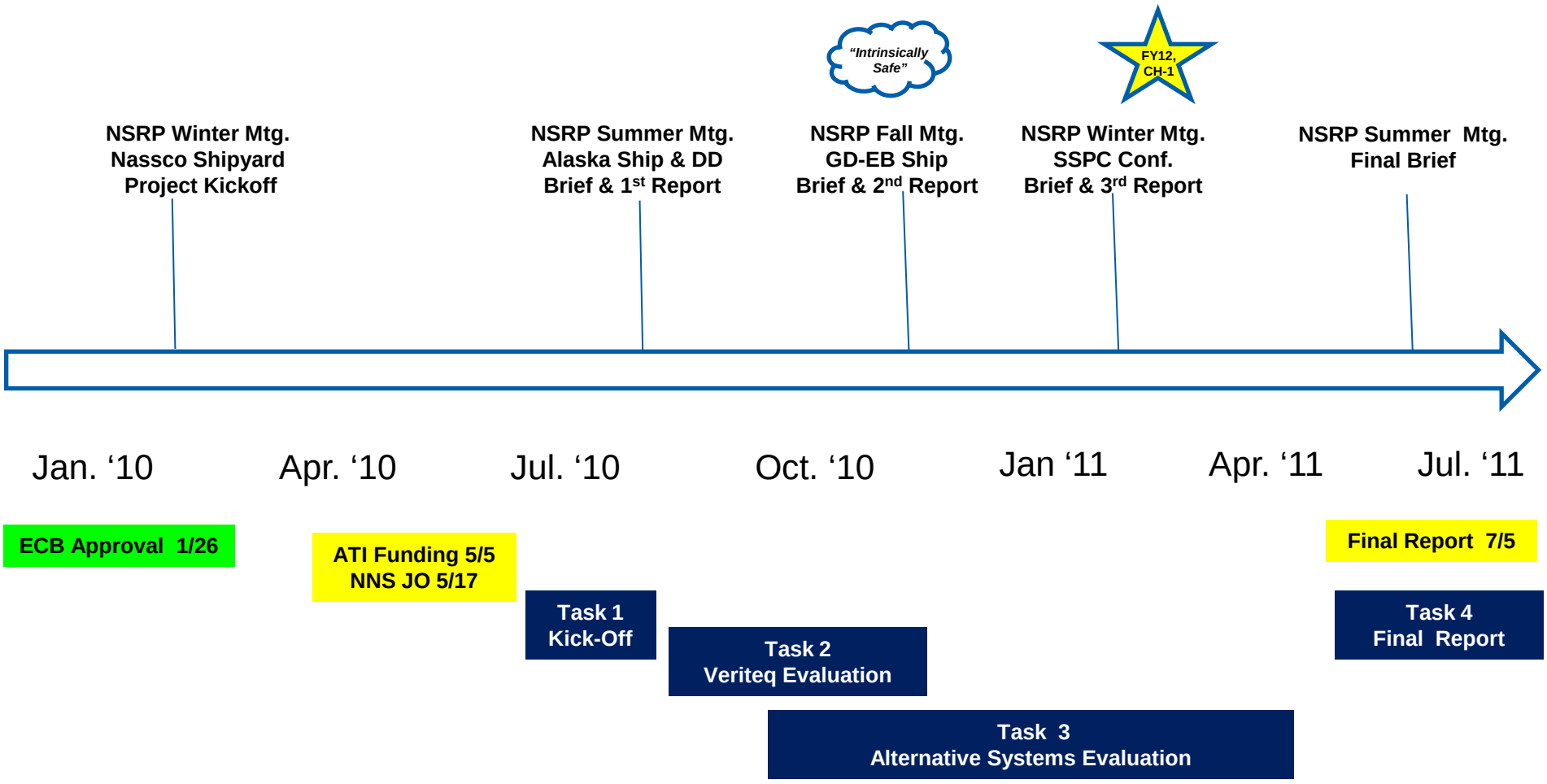
- Of the other units tested, only the Elcometer and Veriteq collected data for the entire test cycle. The DeFelsko unit drops out of auto log mode once battery life reaches low levels (<25%). In auto log 80 data points were collected with the installation of new batteries.

- For one (1) week test cycles: The Elcometer logged 220 data sets, with ~66% battery life remaining. The DeFelsko unit logged 80 data sets, with ~25% battery life remaining.

- Data shows that relative humidity, air and dew point temperatures followed the same trend and were within acceptable ranges.

Alternative Coatings System Environmental Recorder

Plan of Action and Milestones (POA&M)



Key Takeaways

- **NAVSEA Standard Item 009-32 FY-12 (CH-1) adopted** the use of a data logger for obtaining environmental readings.
- Veriteq no longer manufactures its ***"Intrinsically Safe"*** model.
- Several manufactures produces ***"an Alternative Environmental Coatings System Recorder"*** which meets NAVSEA requirements and ship's needs.
- Many of the current models support the evolution of paperless QA.

Backup Slides

Equipment Evaluation

Veriteq

- This unit's data set includes RH and Ts. The dew point temperature must be calculated. The unit has a rolling memory and can store approximately 6000 datasets, before it starts to overwrite them. The interval logging function allows the user to set pre-determined data collection intervals of 1sec thru 24 hours. For this study, the unit was set-up to take a data point every 5 minutes. This was done mainly because Veriteq doesn't have adequate analysis tools, so a macro was written to export the data into a more useable format.

Equipment Evaluation

Elcometer

- This unit's data set includes RH, Ta,Ts,Td and Ts-Td delta. The memory can store up to 36300 datasets. The interval logging function allows the user to set pre-determined data collection intervals of 1sec thru 24 hours. The set-up was not as intuitive, but the supplied instructions were very detailed. This unit had a sleep mode, which shut the unit down between data collection intervals, which greatly increased battery life. We were able to collect an average of 200 data points with a fresh set of batteries. Data was easily downloaded to a PC using supplied software.

Equipment Evaluation

DeFelsko PosiTector

- This unit's data set includes RH, Ta,Ts,Td and Ts-Td delta. The memory can store up to 2500 datasets. The auto log function allows the user to set pre-determined data collection intervals of 1, 5, 10, 15, 30 or 60 minutes. The set-up of this unit was very intuitive and straight forward. One of its shortcomings was that the unit has no sleep mode and stays on during data collection. This of course leads to rapid battery usage. The unit also drops out of auto log mode once battery life reaches 25% life remaining. In auto log, we were able to collect an average of 80 data points on a fresh set of batteries. This equates to about 80 hours (as advertised). Data was easily downloaded to a PC using the supplied PosiSoft software.

Equipment Evaluation

ExTech

- This unit is capable of monitoring and recording relative humidity, ambient and dew point temperature. However, it can record only the ambient or dew point temperatures, one at a time. The set-up of this unit was a bit cumbersome and the instruction manual was not very detailed. The data logging function did allow for setting collection intervals. This unit also had no sleep mode, which leads to rapid battery usage. We saw a battery life of about 24 hours. It was decided that this unit could not meet the requirements for production and was removed from the evaluation.