November 25, 2019
L-2019-204
10 CFR 50.36

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555-0001

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Wastewater Permit Number FL0001562
Request for Use and Approval
of Vapor Infusion Technology 90-Day Trial - Notification

In accordance with Section 3.2.3 of the Turkey Point Units 3 and 4 Environmental Protection Plan (Appendix B of Renewed Facility Operating Licenses DPR-31 and DPR-41), Enclosure 1 to this letter provides a copy of the request for approval to use vapor infusion technology for bio-fouling control. Turkey Point will begin a ninety (90) day trial use of aeration with vapor infusion (bubbles comprised of iodine vapor and/or cupric or ferric corrosion inhibitors) to investigate its effectiveness against bio-fouling, mineral-fouling, and corrosion in the heat exchangers. The trial run will utilize a trial skid and potentially an actual heat exchanger, depending on initial trial skid results.

On November 20, 2019, the Florida Department of Environmental Protection issued approval of the 90-day trial use of vapor infusion technologies to reduce heat exchanger fouling and corrosion in Units 3 and 4. In accordance with Section 3.2.2 of the Turkey Point Units 3 and 4 Environmental Protection Plan (Appendix B of Renewed Facility Operating Licenses DPR-31 and DPR-41), Enclosure 2 provides a copy of the approval.

Should there be any questions, please contact Mr. Robert Hess, Turkey Point Licensing Manager, at 305-246-4112.

Sincerely,

for B. Stamp 11/25/19

Brian Stamp
Site Director
Turkey Point Nuclear Plant

Enclosures

cc: USNRC Regional Administrator, Region II
USNRC Senior Resident Inspector, Turkey Point Plant

ENCLOSURE 1 TO

L-2019-204

Enclosure 1 to L-2019-204
FPL Request to Use Vapor Technology for Bio-Fouling Control [e:mail dated 11/4/2019]

From: Pandya, Meghna
Sent: Monday, November 04, 2019 8:47 AM
To: Wall, Frank (Frank.Wall@FloridaDEP.gov) <Frank.Wall@FloridaDEP.gov>
Subject: FW: PTN Vapor Infusion Trial Run Info

Frank,

FPL Turkey Nuclear wants to do a 90 day trail using the vapor technology for bio-fouling control described below. Please let me know if the given information is sufficient to get a trail approval. I will call you later today to discuss this further.

Thanks,

Meghna Pandya
Environmental Specialist
Florida Power & Light Company | Environmental Services
700 Universe Blvd (JES/JB)
Juno Beach, FL 33408
Office: 561-691-3074
Meghna.Pandya@fpl.com

From: Eguino, Richard <Richard.Eguino@fpl.com>
Sent: Wednesday, October 30, 2019 12:39 PM
To: Pandya, Meghna <Meghna.Pandya@fpl.com>
Cc: Reid, Michael <Michael.Reid@fpl.com>
Subject: PTN Vapor Infusion Trial Run Info

Hi Meghna. Following up on our conversation this morning:

PTN would like to begin a ninety (90) day test period of aeration with vapor infusion (bubbles comprised of iodine vapor and/or cupric or ferric corrosion inhibitors) to investigate its effectiveness against bio-fouling, mineral-fouling, and corrosion in the heat exchangers. The trial run would utilize a trial skid and potentially an actual heat exchanger depending on initial trial skid results.

The vendor explained that this technology was used at the Island Energy oil refinery at Oahu, Hawaii as well as at-sea ships.

Please find attached a PDF from the vendor with more details on the process, and SDSs for the additives that will be tested. Please note only one of the iodine resins will be used—my understanding is that they serve identical functions but are from different manufacturers. Also, below is a table with pertinent information for the additives per the vendor. The dosage and effluent in the table is per unit; in other words, if the trial skid and the heat exchanger are both tested the numbers would apply to each set-up individually.

Please let me know if you would like a teleconference with the vendor to discuss further and I will arrange.

Additive	Purpose	Dosage	Frequency	Effluent Concentration
Wintrol Benzotriazole	Gaseous and aqueous copper and yellow metal corrosion resistance, oxygen capture	< 0.04 g (total 60 grams/month)	Two three-minute infusions per hour	< 100 ppb
Nichem Iodine Resin **-OR-** Hybrid Technologies Iodine Resin H-465	Gaseous oxygen replacement, decreased bubble solubility, increased bubble density, reduced bubble gas mass transfer, increased bubble weight	< 0.02 g (total 30 grams/month) each		< 200 ppb each
VPCI-609	Gaseous and aqueous ferrous metal corrosion resistance, oxygen capture			
VPCI-609S				

Many thanks,

Richard Eguino
Sr. Environmental Specialist
Turkey Point Nuclear Power Plant
9760 SW 344th St
Florida City 33035
305-246-6135 (o)
305-283-8687 (m)

Wincom
Winning Technical Expertise

SAFETY DATA SHEET (SDS)

1-IDENTIFICATION

Wintrol® Benzotriazole

Product code: 30BT100, Wintrol® B-F, Wintrol® B-P, Wintrol® B-G, Wintrol® B-N, Wintrol® B-E, Wintrol® B-FG

Chemical family: Triazole

Recommended use: Yellow metal corrosion inhibitor

Wincom, Inc.
11444 Deerfield Road
Suite B
Blue Ash, Ohio 45242
Information telephone #: (513) 936-0185 (7:30 AM to 4 PM, EST, Monday to Friday)
24 Hr. emergency telephone #: CHEMTEL (US): (800) 255-3924
CHEMTEL (Int'l): 01-813-248-0585

Revision date: 10/06/2016

***All non-emergency questions should be directed to customer service @ (513) 936-0185 or customerservice@wincom-inc.com ***

2 – HAZARDS IDENTIFICATION

Classification of chemical:
White to light yellow flake, granules or powder

This material is classified as hazardous under OSHA regulations (29CFR 1910.1200) (Hazcom 2012)

Hazard classification:
Acute Toxicity, Oral – Category 4, H302
Acute Toxicity, Inhalation – Category 4, H332
Eye Irritation – Category 2A, H319

Label elements:

Hazard Pictogram:

Signal word: Warning

Hazard statements:

H302 + H332	Harmful if swallowed or if inhaled
H319	Causes serious eye irritation

Precautionary statements:

P264	Wash contact area thoroughly after handling
P270	Do not eat, drink or smoke when using this product
P301 + P312	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell
P330	Rinse mouth
P261	Avoid breathing dust
P271	Use only outdoors or in a well-ventilated area
P304 + P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON
P312	CENTER/doctor if you feel unwell
P280	Wear protective gloves/protective clothing/eye protection/face protection
P304+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337-P313	If eye irritation persists: Get medical advice/attention
P501	Dispose of contents/containers in accordance with local regulations

3 – COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	CAS #	Concentration
1,2,3-Benzotriazole	95-14-7	>99.0

4 – FIRST AID MEASURES

Description of first aid measures:

Inhalation: IF INHALED: Remove from exposure, get fresh air. If problems remain or occur later, get medical attention. Self-Contained Breathing Apparatus should be worn if exposed to large quantities.
Skin Contact: IF ON SKIN: Wash off skin thoroughly with water. Remove contaminated clothing and wash before re-use.
Eye Contact: For eye contact, flush eyes with water for 15 minutes. Get medical attention if irritation persists.
Ingestion: Wash out mouth thoroughly with water and give plenty of water to drink. DO NOT induce vomiting unless told by a medical professional. Obtain medical attention.

Symptoms and effects, both acute and delayed:

Acute:
Eye Contact**:** redness, itching, burning or swelling
Skin Contact**:** redness, itching, burning or swelling
Ingestion: pain, vomiting, diarrhea, or collapse
Inhalation: irritation to respiratory tract
Chronic: No data available

5 – FIRE-FIGHTING MEASURES

Extinguishing media:

*Suitable extinguishing media***:** Carbon dioxide, dry-chemical or universal type foam
Unsuitable extinguishing media: Do not use a solid water stream as it may scatter and spread fire

Special hazards arising from substance: Incompatible with oxidizing agents

Hazardous combustion products: none

Special protective equipment and precautions for firefighters: Use Carbon Dioxide Extinguisher (suitable for class B and C fires) or Multi-Purpose Dry Chemical Extinguisher (suitable for class A, B and C fires).

6 – ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: All persons dealing with the clean-up should wear the appropriate chemically protective equipment. Keep others away from spill. Restrict access to area until the spill has been cleaned up.

Methods and material for containment and cleaning up: Use proper personal protective equipment. Isolate and secure the area and follow the appropriate emergency guidelines. If local high concentration of airborne mist occurs, dilute spill with plenty of water and ventilate to disperse mist-laden air. Sweep up spill and reclaim or place in a covered waste disposal container. Report spill to proper authorities.

7 – HANDLING AND STORAGE

Precautions for safe handling: Obtain special instructions before use. Wear proper personal protective equipment. Use only in well ventilated areas. Avoid contact with skin, eyes and clothing. Keep away from heat, sparks and open flame.

Conditions for safe storage: Store in a cool, dry, ventilated area away from any heat source. Storage area should be clearly identified and free of obstruction. Keep containers tightly closed and in an upright position when not in use.

Incompatible materials: Oxidizing agents

Section 7 notes: Change contaminated clothing. Wash hands well after working with substance.

8 – EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limits: Limits have not been established by OSHA and ACGIH

Exposure controls:
Ventilation and engineering measures: Use ventilation if possible, e.g., fans or exhaust systems to keep vapor levels below recommended exposure limits. In case of insufficient ventilation wear suitable respiratory equipment.

Respiratory protection: If good ventilation is not available, wear a respiratory device approved by NIOSH/MSHA for protection against organic vapors, mists and dust. If handling large quantities, use a certified SCBA apparatus.

Eye protection: Wear safety glasses with un-perforated side shields.

Skin protection: Wear chemical resistant gloves for long and repeated contact. Contaminated clothing and shoes should be cleaned before reusing.

Other protective equipment: Safety shower/eye wash

General hygiene considerations: Acceptable industrial hygiene practices should be maintained.

9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance: White to light yellow flake, granules, pellets or powder
Odor: Slightly Sweet Odor
Odor threshold: Data currently unavailable
pH: 5.5 – 6.0
Melting point: 98.5 °C
Boiling point: 204 °C @ 15 mm Hg
Vapor pressure (mmHg): $4.0X01^{-2}$ @ 20 °C
Vapor density: 4.1
Evaporation rate: Non-volatile
Flash point: 195°C; 383°F
Upper/lower flammability limits: 2.4% by volume (lower)
Solubility in water: 2.0 wt % @ 25°C
Other solubilities: Soluble in benzene, toluene and N,N-dimethylformamide and ethanol
Percent volatile: None
Log P (octanol-water): Log K_{ow}: 1.44
Autoignition temperature: 400°C; 752°F
Decomposition temperature: Data currently unavailable
Gibbs energy: 442.65 kj/mol

Section 9 notes: The above chemical properties are a compilation of data from the NTP, Chemdraw and Wincom, Inc.

10 – STABILITY AND REACTIVITY

Reactivity: Not normally reactive

Stability: Stable under normal conditions

Incompatible materials: Oxidizing Agents

Hazardous decomposition products or by-products: FIRE: Nitrogen oxides, carbon monoxide and carbon dioxide. HCN in reducing atmospheres

Possibility of hazardous reactions: Hazardous polymerization does not occur.

11 – TOXICOLOGICAL INFORMATION

Information on likey routes of exposure:
Routes of entry – inhalation: yes
Routes of entry – skin & eye: yes
Routes of entry – ingestion: yes
Routes of entry – skin absorption: yes

Potential health effects:
Signs and symptoms of short term (acute) exposure:
Signs and symptoms – inhalation: cough, difficulty breathing, may be irritating to respiratory tract; in severe cases respiratory irritation can progress into pulmonary edema
Signs and symptoms – ingestion: pain, vomiting, diarrhea and collapse
Signs and symptoms – skin: redness, itching, burning and swelling
Signs and symptoms – eyes: irritation, pain, swelling, lacrimation and photophobia

Potential chronic health effects: No observed chronic health effects

Mutagenicity: Not considered to be mutagenic

Carcinogenicity: This product is not listed on OSHA, NIOSH, IARC or NTP lists as cancer-causing

Reproductive effects: No evidence of pathology in reproductive organs

Sensitization to material: Not expected to be a skin sensitizer
No data available to indicate material may be a respiratory sensitizer

Specific target organ effects: Not expected to produce specific target organ toxicity from repeated exposure

Medical conditions aggravated by overexposure: No data found

Toxicological data:
Oral LD_{50} (Rat): 560 mg/kg
Dermal LD_{50} (Rabbit): > 2,000 mg/kg
Inhalation LC_{50}: 1.5 mg/L

In a test for primary skin irritation and sensitization on guinea pigs, 1-H-benzotriazole was at most mildly irritating in concentrations up to 50% in ethanol and was not a sensitizer. The dry powder is severely irritating to the rabbit eyes (0.1 ml unwashed) but prompt water washing reduces irritation considerably. [Clayton, G.D., F.E. Clayton (eds.) Patty's Industrial Hygiene and Toxicology. Volumes 2A, 2B, 2C, 2D, 2E, 2F: Toxicology. 4th ed. New York, NY: John Wiley & Sons Inc., 1993-1994., p. 3347(NTP WEBSITE)

Human toxicity levels: None found

12 – ECOLOGICAL INFORMATION

Ecotoxicity: Acute toxicity of benzotriazole:
Toxicity to fish: LC_{50}/96 hr/*B. rerio* = 100 mg/l
Toxicity to crustacean: EC_{50}/48 hr/*D. magna* = 91-141 mg/l
Toxicity to algae: EC_{50}/72 hr/*S. subspicatus* = 231 mg/l

Persistence and degradability: readily biodegradable

Bioaccumulation potential: Log K_{ow}: 1.44

Mobility in soil: expected to have high mobility in soil; affected by pH ("1,2,3-Benzotriazole-National Library of Medicine HSDB Database." *U.S. National Library of Medicine*. N.p., 01 Jan. 1993. Web. 30 Apr. 2013. <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/r?dbs+hsdb:@term+@na+1,2,3-BENZOTRIAZOLE>.)

13 – DISPOSAL CONSIDERATIONS

Waste disposal method: Dispose of in accordance with federal, state and local regulations.

14 – TRANSPORTATION INFORMATION

DOT classification: This product is currently not a DOT controlled material in the United States.

15 – REGULATORY INFORMATION

U.S. federal regulations
TSCA (Toxic Substance Control Act): 8(b) inventory: Benzotriazole-1,2,3

EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances 202-394-1

Worldwide Chemical Inventory Status: USA,TSCA,CANADA and DSL

California Proposition 65: None of the components in Wintrol® B are in the current P-65 chemicals list.

HMIS hazard classification

Health: 2	**Flammability: 1**	**Physical hazard: 0**
Protection: E		

National Fire Protection (U.S.A.)

Health: 2	**Flammability: 1**	**Reactivity: 0**

16 – OTHER INFORMATION

Preparation information: Prepared on the 21st of November 2013

Legend: ACGIH: American Conference of Governmental Industrial Hygienists
CAS: Chemical Abstract Service
CFR: Code of Federal Regulations
DOT: Department of Transportation
DSL: Domestic Substance List (Canada)
EC: Effective Concentration
EINECS: European Inventory of Existing Commercial chemical Substances
EPA: Environmental Protection Agency
HMIS: Hazardous Material Identification System
IARC: International Agency for Research on Cancer
LC: Lethal Concentration
LD: Lethal Dose
NIOSH: National Institute of Occupational Safety and Health
NTP: National Toxicology Program
OSHA: Occupational Safety and Health Administration
SCBA: Self Contained Breathing Apparatus
SDS: Safety Data Sheet/Material Safety Data Sheet

DISCLAIMER:

While the descriptions, designs, data and information contained herein are presented in good faith and believed to be accurate, it is provided for your guidance only. Because many factors may affect processing or application/use, we recommend that you make tests to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either express or implied, including warranties of merchantability or fitness for a particular purpose, are made regarding products described or designs, data or information set forth, or that the products, designs, data or information may be used without infringing the intellectual property rights of others. In no case shall the descriptions, information, data or designs provided be considered a part of our terms and conditions of sale. Further, you expressly understand and agree that the descriptions, designs, data, and information furnished by Wincom hereunder are given gratis and Wincom assumes no obligation or liability for the description, designs, data and information given or results obtained, all such being given and accepted at your risk. Data obtained from EPA, eChemPortal, *Benzotriazoles Category Justification and Testing Rationale.* Rep.,2001. Print., "1,2,3-Benzotriazole-National Library of Medicine HSDB Database." *U.S. National Library of Medicine*. N.p., 01 Jan. 1993. Web. 30 Apr. 2013., and Wincom Lab.

NICHEM

Water

MSDS

Iodinated Resin

Iodine-based water purifying media

(Date Issued: 01.04.16)

1. IDENTIFICATION OF THE PREPARATION	
Product Name	IODINATED RESIN
Application	Iodine removal from drinking water
Company Identification	NICHEM SOLUTIONS Plot No. A-387, Rd. No.28, Ramnagar, Wagle Estate, Thane (W)–400604.Maharashtra, INDIA.
Contact Details	Telefax: +91-22-25821587/88 Email: info@nichem.solutions Website: www.nichem.solutions

2. COMPOSITION OF INGREDIENTS			
Description	**Contents**	**CAS No.**	**HS Code**
Anion Exchange Resin loaded with Iodine.	Cross Linked Styrene Resin	55844-94-5	39140090

3. HAZARD IDENTIFICATION

Contact with Eyes: May cause irritation.
Contact with Skin: May cause yellowing
Ecological Hazards: Oxidizing material, should not be exposed to high pH

4. FIRST AID MEASURES

General information: Bring affected persons out of danger area. Observe self-protection (body protection, eye protection, respiratory protection).
After skin contact: Remove contaminated clothing. Remove particles and wash affected area with water.
After eye contact: With eye held open, thoroughly rinse immediately with plenty of water for at last 15 minutes. Remove contact lenses if easily possible. Seek medical attention if needed.
After swallowing: Rinse mouth with water. Induce vomiting & seek medical help.

5. FIRE FIGHTING MEASURES

- In case of fire, use foam, carbon dioxide or dry agent.
- Substance evolves toxic fumes if ignited on purpose, wear self-contained breathing apparatus (See section 10).
- Wear full protective clothing including chemical protection suit.
- Prevent run-off water from entering drains if possible.
- If polluted water reaches drainage systems or water courses, immediately inform appropriate authorities.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Keep people away. Floor may become slippery, take care to avoid falls.
Environmental precautions: Do not allow to enter public sewages and water courses.

Clean-up actions: Wet with water and sweep-up and transfer to plastic containers for recovery or disposal as advised in Section 13.

7. HANDLING AND STORAGE

HANDLING: Information for safe handling
Special care is required for handling of the product to prevent contamination. Protect from impurities. Never return spilt product to original container. The usual precautions for handling chemicals should be observed. Risk of static discharge from dry beads.
STORAGE CONDITION: Store above 0°C in wet conditions in water. Keep at temperatures not exceeding 40°C. Avoid dehydration (when rewetted volume may increase and cause a rupture of the packaging if not allowed to swell. Keep only in the original container.

8. EXPOSURE CONTROL/PERSONAL PROTECTION

General Protective and hygienic measures
Protection of hands: Wear protective gloves made of PVC, neoprene or natural rubber.
Eye protection: Wear safety goggles.
Body protection: Change work clothes immediately if spilled with the product.

9. PHYSICAL & CHEMICAL PROPERTIES

Physical Properties	
Form	Spherical beads
Colour	Pitch Black
Odor	Strong Iodine Odor
Chemical Properties	
Base	Anion Exchange Resin loaded with Iodine
Bulk Density **(Wet basis)** **(Dry basis)**	 1.50 – 1.60 gm/cc 1.2 – 1.3 gm/cc
Flash Point	Not Applicable
Flammability point	The preparation starts burning over 230°C only if ignited
Auto-Ignition Temp.	Over 500°C
Solubility	Insoluble in water & solvents
Stability	Stability at ambient temperature under normal conditions of use

10. STABILITY AND REACTIVITY

- Stable at Room Temperature
- **Conditions to be avoided:** Prolonged exposure to air & sunlight.
- **Substances to be avoided:** Incompatible with strong reducing agents. Contact with strong reducing agents, especially hydrazine, sodium metabisulphite and aldehydes may cause severe reaction.
- **Reactivity:** Combustion products may include monomers, residual organics, carbon and iodine.
- **Solubility:** It is insoluble in water & solvents

11. TOXICOLOGICAL INFORMATION

Chronic Toxicity has not been demonstrated by **POLYSTYRENE COMPOUNDS.**
They are not listed as a carcinogen by MAK, IARC, NTP, OSHA, and ACGIH.
Carcinogenicity: No evidence of carcinogenic effects
Teratogenicity: No evidence of teratogenic effects
Mutagenicity: No evidence of mutagenic effects
The LD50 value (Oral: Rat) is **>2000 mg/kg body weight.**

12. ECOLOGICAL INFORMATION

Eco-toxicity: Not known
Mobility: Insoluble in water & solvents
Persistence and Biodegradability: Not readily biodegradable
Risk of bioaccumulation: None
Other adverse effects: None

13. DISPOSAL CONSIDERATIONS

Recommendation: Product
The product as delivered is a special, hazardous waste. The used product, fully loaded with non-hazardous ions is a non-hazardous special waste.
In any case,please dispose-off the product according to local,regional & national regulations.
Unclean packaging:
Rinse empty containers with water prior to disposal. Take decontaminated packaging to local recycling centre.

14. TRANSPORT INFORMATION

Adsorbent resins as supplied are not classified as hazardous for transport. Product is safe for transport by Roadways, Airways or Waterways. No special precautions need to be taken for the product with adequate packing in plastic bottles/containers – as mentioned in Section 7.
Not classified as dangerous for transport as per IATA guidelines
Classification: None

15. REGULATORY INFORMATION

Labeling of substances in line with EC Directive 67/546/EEC and amendment.
Risk phrases: R36 – Irritating to eyes
Safety phrases:

S2	- Keep out of reach of children
S7	- Keep container tightly closed
S26	- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice
S28	- After contact with skin, wash immediately with plenty of water
S36/37/39	- Wear suitable protective clothing, gloves, eye/face protection
S45/46	- If swallowed or in case of accident or if you feel unwell, seek medical advice immediately

16. OTHER INFORMATION

Disclaimer: NICHEM SOLUTIONS has internally & externally verified the effectiveness & efficacy of its products by a standard protocol. We expect to reproduce the same results at customer's end by adopting same protocol. We take responsibility for the uniform quality of our products. However, NICHEM SOLUTIONS will not be responsible for any consequential liability of any nature for whatsoever reason.

HYBRID TECHNOLOGIES CORPORATION

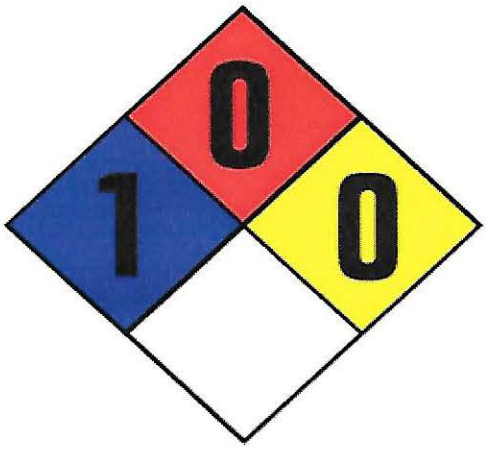
SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY INFORMATION			
PRODUCT TYPE:	Trimethylamine functionalized chloromethylated copolymer of styrene and divinylbenzene in the iodide form.		
PRODUCT NAME:	Iodinated Resin H-465		
COMPANY ID:	Hybrid Technologies Corporation 3814 110th St., Karlstad, MN 56732 USA		
TELEPHONE NUMBER:	**INFORMATION:**	**CORPORATE**	218-436-3155
	MEDICAL EMERGENCY:	**CHEMTREC**	800-424-9300
	TRANSPORTATION EMERGENCY:	**CHEMTREC**	800-424-9300
DATE PREPARED:	May 15, 2015	REVISION: 0	

SECTION 2: HAZARD(S) IDENTIFICATION

HMIS RATINGS	
HEALTH	1
FLAMMABILITY	0
PHYSICAL HAZARD	0
PERSONNAL PROTECTION	B

NFPA RATINGS



GUIDE

4 – EXTREME/SEVERE
3 – HIGH/SERIOUS
2 – MODERATE
1 – SLIGHT
0 – MINIMUM
W – WATER REACTIVE
OX - OXIDIZER

PICTOGRAM	SIGNAL WORD	HAZARD STATEMENT
	**Warning**	**May cause slight eye and skin irritation.**

PRECAUTIONARY STATEMENT(S)	
PREVENTION	Wear eye and skin protection.
RESPONSE	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. In case of contact with skin, wash with mild soap and water. If irritation persists, see a physician.
STORAGE	Cool, dry, away from sunlight.

OTHER HAZARDS
NONE

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS			
PERCENT BY WEIGHT	**COMMON NAME (Ingredient / Component)**	**CAS NO.**	**IMPURITIES**
46%	Iodine / I_2	7553-56-2	None
54%	Styrene, divinylbenzene and ethylstyrene copolymer, chloromethyl trimethylamine functionalized in the chloride form	60177-39-1	None

SECTION 4: FIRST – AID MEASURES	
NECESSARY FIRST AID INSTRUCTIONS	
INHALATION FIRST AID	Remove victim to fresh air and keep at rest in a position comfortable for breathing. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
SKIN CONTACT FIRST AID	Wash contaminated skin with mild soap and water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur.
EYE CONTACT FIRST AID	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Seek medical attention if irritation persists.
INGESTION FIRST AID	If material has been swallowed and the exposed person is conscious, drink large quantities of milk or water, transport to hospital and observe for signs of Iodine toxicity. If no hospital is available, induce vomiting, drink large quantities of milk or water and observe for adverse reaction. If unconscious or convulsing, transport to hospital immediately. Never give anything by mouth to an unconscious person.
DESCRIPTION OF MOST IMPORTANT SYMPTOMS	
No additional information available	
RECOMMENDATIONS FOR IMMEDIATE MEDICAL CARE	
No additional information available	

SECTION 5: FIRE – FIGHTING MEASUURES	
SUITABLE EXTINGUISHING MEDIA	Use an extinguishing agent suitable for the surrounding fire. In case of fire, use water spray (fog), carbon dioxide, foam or dry chemical.
UNSUITABLE EXTINGUISHING MEDIA	None known
SPECIFIC HAZARDS	Iodine fumes and iodine compounds, alkybenzenes, vinyl benzenes, naphthalene benzealdehydes, phenol, carbon dioxide, organic amines, nitrogen oxides, ammonia, and oxides of sulfur are possible combustion products.
PERSONAL PROTECTIVE EQUIPMENT	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

SECTION 6: ACCIDENTAL RELEASE MEASURES	
PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES	
PERSONAL PRECAUTIONS	No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Put on appropriate personal protective equipment. Hazard of slipping on spelled product.
ENVIRONMENTAL PRECAUTIONS	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
CONTAINMENT AND CLEAN-UP	Move containers from spill area. Sweep up material and place in a designated, labeled waste container. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. Prevent entry into sewers, water courses, basements of confined areas.
OTHER INFORMATION	None

SECTION 7: HANDLING AND STORAGE	
PRECAUTIONS FOR SAFE HANDLING	Remove contaminated clothing and protective equipment before entering eating areas. Workers should wash hands and face before eating, drinking and smoking. Put on appropriate personal protection equipment. Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed.
CONDITIONS FOR SAFE STORAGE	Store between the following temperatures: 1 to 40^0C (33.8 to 104^0F). Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. Empty containers or liners may retain some product residues. It is recommended to store iodinated resins at temperatures above the freezing point of water. If the resin should become frozen, the resin should not be mechanically handled and should be left to thaw out gradually at ambient temperature. It must be completely thawed before handling or use. No attempt should be made to accelerate the thawing process.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION			
ENGINEERING CONTROLS	Good general ventilation should be sufficient to control worker exposure to airborne contaminants.		
RESPIRATORY PROTECTION	Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.		
SKIN PROTECTION	Wear suitable protective clothing and gloves. Suitable protective footwear. Maintain eye wash station.		
EYE /FACE PROTECTION	If contact with product is possible, wear safety glasses with side shields.		
	RESULT	**OSHA 8 HR mg/m³**	**ACGIH TLV 8 HR mg/m³**
EXPOSURE LIMITS / GUIDELINES		1 mg/m³ (0.1ppm)	0.1 mg/m³ (0.01 ppm)
	RESULT	**OSHA 8 HR mg/m³**	**ACGIH TLV 8 HR mg/m³**
PARTICULATES NOT OTHERWISE REGLATED (PNOR)	N/A		
PARTICULATES NOT OTHERWISE CLASSIFIED (PNOC)	N/A		

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES			
APPEARANCE	Solid spherical beads	**MOLECULAR WEIGHT**	N/A
COLOR	Purplish-black	**ODOR THERSHOLD**	No data available
ODOR	Slight iodine	**VAPOR PRESSURE**	0.3 mmHg @ 20^0 C (68.0^0F)
PH VALUE	N/A	**VAPOR DENSITY**	Not available
MELTING POINT	N/A	**RELATIVE DENSITY**	2.15 g/cm^3 (20^0C (68.0^0F)
FREEZING POINT	N/A	**SOLUBILITY**	0.2 – 5.0 mg/L @ 20^0C (68.0^0F)
INITIAL BOILIING PONT	N/A	**PARTITION COEFFICEINT**	Not available
FLASHPOINT	N/A	**AUTO IGNITION TEMP.**	Over 500^0C (932^0F)
EVAPORATON RATE	N/A	**DECOMP. TEMP.**	No data available
FLAMMABILITY	Over 230^0 C only if ignited.	**VISCOSITY**	N/A
UEL	N/A		
LEL	N/A		

SECTION 10: STABILITY AND REACTIVITY	
REACTIVITY	None when handled and stored properly. Slowly reacts with solid metals.
CHEMICAL STABILITY	The product is stable under normal ambient temperature and conditions while in storage and being handled.
POSSIBILITY OF HAZARDOUS REACTIONS	Heat, direct sunlight, incompatible materials.
CONDITIONS TO AVOID	
INCOMPATIBLE MATERIALS	Ammonia solutions, metal powders, sulphur, alkali metals, reducing agents, combustible materials, metal acetylides, antimony, ammonium hydroxide, acelytene, phosphorous, magnesium, zinc, sodium, potassium, lithium, liquid chlorine, metal carbides, aluminum, fluorine.
HAZAROUS DECOMPOSITION PRODUCTS	Depending upon temperature, air supply and the presence of other materials, decomposition products can include: sulfur oxides, iodine vapor and iodine compounds, carbon monoxide, carbon dioxide, benzene compounds, nitrogen oxides, hydrocarbons, organic nitrates, styrene.
INSTABILITY TEMPERATURE	Not available
POLYERIZATION	Will not occur.
CORROSIVITY	Weak corrosive to most grades of steel.

SECTION 11: TOXICOLOGICAL INFORMATION		
IODINE / CAS NO. 7553-56-2		
LD50 ORAL RAT		14000 mg/kg
LD50 DERMAL RAT		220 mg/kg
ATE US (ORAL)		14000 mg/kg bodyweight
ATE US (DERMAL)		220 mg/kg bodyweight
CARCINOGENICITY		Iodine – Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.
IODINATED RESIN H-465		
SKIN CONTACT		Does not cause irritation with normal handling.
EYE CONTACT		Iodinated resin beads in the eye can cause irritation, pain, redness and tearing of eyes.
INGESTION	**ACUTE**	No specific data
	CHRONIC	No specific data
INHALATION	**ACUTE**	No specific data
	CHRONIC	No specific data
REPRODUCTIVE EFFECTS		No specific data
NEUROTOXICITY		No specific data
OTHER EFFECTS		No specific data
TARGET ORGANS		No specific data

SECTION 12: ECOLOGICAL INFORMATION
The material in its original state, is not harmful to the environment.

SECTION 13: DISPOSAL CONSIDERATIONS	
SPILL / LEAK PROCEDURES	Isolate spill area to prevent falls as material can be a slipping hazard. Avoid contact with eyes and skin. Material is heavier than water and has limited water solubility. It will collect on the lowest surface.
CLEANUP	Clean up floor area. Sweep up. Regulatory Requirements: Follow all applicable Federal, State, Local, or Provincial regulations.
REGULATORY REQUIREMENTS	If discarded in its purchased form, this product would not be a hazardous waste either by listing or by characteristic. However, under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste. (40 CFR 261.20-24).
DISPOSAL	The generation of waste should be avoided or minimized wherever possible. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Do not incinerate or burn product waste and its containers. Waste disposal should be in accordance with existing federal, state, provincial and or local environmental control laws.

SECTION 14: TRANSPORT INFORMATION		
LAND - DOT	UN/NA IDENTIFICATION NUMBER:	Not regulated
	UN-PROPER SHIPPING NAME:	Not regulated
	TRANSORT HAZARD CLASS:	Not regulated
	PACKING GROUP:	Not regulated
	MARINE POLLUTANT:	Not regulated
	HAZARD CLASS:	Not regulated
WATER – IMO / IMDG	UN/NA IDENTIFICATION NUMBER:	Not regulated
	UN-PROPER SHIPPING NAME:	Not regulated
	TRANSORT HAZARD CLASS:	Not regulated
	PACKING GROUP:	Not regulated
	MARINE POLLUTANT:	Not regulated
AIR – ICAO / IATA	UN/NA IDENTIFICATION NUMBER:	Not regulated
	UN-PROPER SHIPPING NAME:	Not regulated
	TRANSORT HAZARD CLASS:	Not regulated
	PACKING GROUP:	Not regulated
	MARINE POLLUTANT:	Not regulated

SECTION 15: REGLATORY INFORMATION	
OSHA	None
OSHA	None
CAA	None
CERCLA	None
SARA	None
SARA HAZARD CATEGORIES 311 / 312	N/A
TSCA	None

SECTION 16: OTHER INFORMATION	
USERS RESPONSIBILITYY:	A bulletin such as this cannot be expected to cover all possible individual situations. As the user has the responsibility to provide a safe workplace, all aspects of an individual operation should be examined to determine if or where, precautions are required. Any health hazard and safety information herein should be passed on to your customers or employees.
DISCLAIMER:	Hybrid Technologies Corporation provides the information contained in the (SDS) and is based upon information and tests believed to be accurate and represents the best information currently available to us. However, since conditions of handling and use are beyond our control, Hybrid Technologies Corporation makes no guarantee of results and assumes no liability for damages incurred by use of this material. All chemicals may present unknown health hazards are described herein, we cannot guarantee that these are the only hazards which exist. Final determination of suitability of the chemical is the sole responsibility of the user. HYBRID TECHNOLOGIES CORPORATION MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, IINCLUDING WITHOUT LIIMITATION ANY WARRANTIES OF MERCHANTABILIITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, HYBRID TECHNOLOGIES CORPORATION WILL NOT BE RESPONSIBLE FOR DAMAGES OR EXPENSES ARISING OUT OF OR IN ANY WAY CONNECTED WITH THE HANDLING, STORAGE, USE OR DISPOSAL OF THIS PRODUCT RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION:
REVISION INDICATOR:	Revision 0: (This SDS replaces the former MSDS for this product pursuant to OSHA 1910.1200(g) Appendix D. The MSDS for this product should be considered obsolete).

CORROSION INHIBITING VpCI® POWDERS

VpCI®-609/609S Biodegradable Powders

Corrosion Inhibiting Powder for Ferrous Metals Patent Pending

PRODUCT DESCRIPTION

VpCI®-609 is a water-soluble Vapor phase Corrosion Inhibitor (VpCI®) powder for wet or dry corrosion protection of ferrous metals and aluminum. VpCI®-609 is also available as VpCI®-609S (with silica).

FEATURES

- Accepted by Cefas as an offshore chemical. Registered under OCNS number 25717 allowing use at 5,000 ppm.
- Provides liquid, vapor-phase, and interface protection (above the liquid level).
- Creates a monomolecular inhibiting layer on metal surface.
- Provides up to 24 months of continuous protection.
- Does not contain nitrites, phosphates, or heavy metals.

ADVANTAGES

- Vapor-phase inhibiting action protects inaccessible and recessed surfaces
- If the VpCI® layer is disturbed by moisture or the opening of an enclosed space, the layer is replenished by continuous vapor redeposition.
- Prevents future corrosion of precoated and painted surfaces.
- VpCI® layer typically does not need to be removed prior to processing or use.
- If required, powder is easily removed by air gun or water flush.
- Does not increase alkalinity.
- Provides economical protection for very large applications.

TOXICOLOGICAL TESTING RESULTS

(Performed by Nortech A.S. (Norway))*

- Biodegradability: 100% biodegradable in marine environment, rapidly degradable substance (OECD** 306, BOD 28 Marine test).
- Toxicity: Very low (LD-50 = 5,000 mg oral-rat).
- Bioaccumulation potential: none (OECD Guideline 117).

*Testing performed in accordance with Oslo-Paris com mission protocol
**Organization for Economic Co-Operation and Development

TYPICAL USES

- Tubular structures, pipes, and vessels.
- Voids, cavities, and tanks.
- Internal surfaces of compressors, turbines, engines, tanks, boilers, heat exchangers.
- Steam condensate lines, closed circuit heating, and cooling systems
- Equipment during and after hydrostatic testing.
- Parts, components, and completed assemblies during shipping and storage.
- Additive to shot-blasting media, wet blasting.
- Additive to standing water.

PHYSICAL PROPERTIES

VpCI®-609

Appearance	Off white crystalline powder
pH	6-7 (1% aqueous solution)
Solubility in water	15%
Bulk Density	38-39 lb/ft^3 (0.61-0.63 kg/l)

VpCI®-609S

Appearance	White to off white powder
pH	5.9-6.9 (1% water)
Bulk Density	37-38 lb/ft3 (0.59-0.61 kg/l)

METALS PROTECTED

- Carbon steel
- Stainless steel
- Aluminum
- Other ferrous metals

METHOD OF APPLICATION

Apply VpCI®-609 in dry form by dusting, fogging, or sprinkling. Apply VpCI®-609 in aqueous form by spray, flush, or immersion. After application simply cover and close or seal the interior cavity or void (Fogging is easily achieved by using a low pressure air hose and sandblast cup. Large conventional sandblasting systems can also be used).

DOSAGE

For powder application with average environmental conditions, use 0.3-0.5 ounce (8.5-14 grams) of VpCI®-609 per 1 cubic foot (28 liters) of enclosed space (300-500 g/m^3). The dosage can be increased for more severe conditions. For aqueous submersion or partial submersion applications, consult your Cortec® Representative.

METHOD OF REMOVAL

When required, VpCI®-609/609S in powder form can be easily removed by using a low pressure air gun or by a water rinse. Typically, if applied in aqueous form, the product does not require removal. If necessary, a simple water rinse or flush will suffice.

PACKAGING AND STORAGE

VpCI®-609/609S powders are available in 5 pound (2.3 kg), 50 pound (23 kg), and 100 pound (45 kg) moisture barrier bags packed in fiber-lined drums. Also available in pouches such as EcoPouch®. Store in a sealed container in a dry warehouse and avoid direct exposure to sunlight with temperatures not exceeding 150°F (65°C). Under these conditions shelf life is up to 24 months.

LIMITATIONS

- Do not use on copper, copper-based alloys, and other soft yellow metals. Compatibility with non-metalics should be evaluated.
- Caking of powder may occur when it is exposed to moisture and then dried. The likelihood of this is increased when powder is exposed to high heat and multiple wet/dry cycles. To avoid caking of powder do not over apply or unevenly disperse the dry powder. In aqueous applications make sure powder has been totally dissolved before using. Over extended periods of protection, this caking may require a more involved cleaning prodedure. Contact Cortec® for futher details.
- Powder is not soluble in hydrocarbon fluids. Rinse powder from vessels before adding hydrocarbon fluid.
- Powder should be removed from the area on each side of weld before welding, or other high temperature processing.

Note: Regular VpCI®-609 has a tendency to clump. For dry fogging application use VpCI®-609S (with silica) where acceptable.

STANDARD TEST METHODS

NACE Standard TM0208-2008	Vapor Inhibiting Ability
NACE RP0487-2000	Selection of Rust Preventives
OECD 306, BOD-28	Marine Biodegradability Test
EPA/600/4-90/027F	Sea Water Toxicity Test
MIL-I-22110C	Vapor Inhibiting Ability

FOR INDUSTRIAL USE ONLY
KEEP OUT OF REACH OF CHILDREN
KEEP CONTAINER TIGHTLY CLOSED
NOT FOR INTERNAL CONSUMPTION
CONSULT SAFETY DATA SHEET FOR MORE INFORMATION

Distributed by:

CORTEC CORPORATION
Environmentally Safe VpCI®/MCI® Technologies
4119 White Bear Parkway, St. Paul, MN 55110 USA
Phone (651) 429-1100, Fax (651) 429-1122
Toll Free (800) 4-CORTEC, E-mail info@cortecvci.com
http://www.cortecvci.com

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SECTION 1: Identification of the substance/mixture and of the company/undertaking

· **1.1 Product identifier**

· **Trade name: VpCI®-609**

· **1.2 Relevant identified uses of the substance or mixture and uses advised against**
No further relevant information available.

· **Application of the substance / the mixture** Corrosion inhibitors

· **1.3 Details of the supplier of the safety data sheet**

· **Manufacturer/Supplier:**

Cortec Corporation
4119 White Bear Parkway
St. Paul, MN 55110 USA
Phone (651) 429-1100
Fax (651) 429-1122

· **Information department:** regulatory@cortecvci.com

· **1.4 Emergency telephone number:**
Spill, Leak, Fire, Exposure, or Accident
24 hour CHEMTREC contact:
USA and Canada 1-800-424-9300
International +1-703-527-3887 (collect calls accepted)
UK +(44)-870-8200418

SECTION 2: Hazards identification

· **2.1 Classification of the substance or mixture**

· **Classification according to Regulation (EC) No 1272/2008**

GHS07

Skin Irrit. 2 H315 Causes skin irritation.
Eye Irrit. 2 H319 Causes serious eye irritation.
STOT SE 3 H335 May cause respiratory irritation.

· **2.2 Label elements**

· **Labelling according to Regulation (EC) No 1272/2008**
The product is classified and labelled according to the CLP regulation.

· **Hazard pictograms**

GHS07

· **Signal word** Warning

· **Hazard-determining components of labelling:**
proprietary ammonia derivate

· **Hazard statements**
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H335 May cause respiratory irritation.

· **Precautionary statements**
P261 Avoid breathing dust/fume/gas/mist/vapours/spray.

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P280 Wear protective gloves/protective clothing/eye protection/face protection.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P321 Specific treatment (see on this label).
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

· **2.3 Other hazards**
WARNING! AS WITH ALL POWDERS, MAY FORM COMBUSTIBLE DUST CONCENTRATION IN AIR
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

SECTION 3: Composition/information on ingredients

· **3.2 Chemical characterisation: Mixtures**
· **Description:** Mixture of the substances listed below with nonhazardous additions.

· **Ingredients:**		
proprietary ammonia derivate	Skin Irrit. 2, H315; Eye Irrit. 2, H319; STOT SE 3, H335	50-100%

· **Additional information**
The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.
For the wording of the listed hazard phrases refer to section 16.

SECTION 4: First aid measures

· **4.1 Description of first aid measures**
· **After inhalation** In case of unconsciousness place patient stably on side position for transportation.
· **After skin contact** Immediately wash with water and soap and rinse thoroughly.
· **After eye contact**
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
· **After swallowing** Do not induce vomiting; call for medical help immediately.
· **4.2 Most important symptoms and effects, both acute and delayed** No further relevant information available.
· **Information for doctor** Show this safety data sheet to the doctor in attendance.
· **4.3 Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

SECTION 5: Firefighting measures

· **5.1 Extinguishing media**
· **Suitable extinguishing agents**
CO2, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
· **5.2 Special hazards arising from the substance or mixture**
Carbon monoxide (CO)
Nitrogen oxides (NOx)
As with all dusts, fine particles suspended in air in critical proportions and in the presence of an ignition source may ignite and/or explode. Dust may be sensitive to ignition by electrostatic discharge, electrical arcs, sparks, welding torches, cigarettes, open flame, or other significant heat sources. As a precaution, implement standard safety measures for handling finely divided organic powders.
AIT (ASTM E2021): n/a °C

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· **Additional information**
Explosion: Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

SECTION 6: Accidental release measures

· **6.1 Personal precautions, protective equipment and emergency procedures**
Use respiratory protective device against the effects of fumes/dust/aerosol.

Wear protective equipment. Keep unprotected persons away.

Use extreme caution when dispersing dust in the air. Non-sparking tools/equipment should be used.
· **6.2 Environmental precautions:** No special measures required.
· **6.3 Methods and material for containment and cleaning up:** Ensure adequate ventilation.
· **6.4 Reference to other sections**
No dangerous substances are released.
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

SECTION 7: Handling and storage

· **7.1 Precautions for safe handling**
Ensure good ventilation/exhaustion at the workplace.
Prevent formation of dust.
· **Information about protection against explosions and fires:**

Keep ignition sources away - Do not smoke.

Protect against electrostatic charges.
Use explosion-proof apparatus / fittings and spark-proof tools.
Dust can combine with air to form an explosive mixture.
Wear shoes with conductive soles.
Minimize dust generation and accumulation.
Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces.
Dry powders can build static electricity charges when subjected to the friction of transfer and mixing operations.
Provide adequate precautions, such as electrical grounding and bonding.
As a precaution to control dust explosion potential, implement safety measures to control ignition sources and dispersion of dusts. See NFPA standard 654, OSHA 29CFR1910.39 and others for more details.

· **7.2 Conditions for safe storage, including any incompatibilities**
· **Storage**
· **Requirements to be met by storerooms and receptacles:** No special requirements.
· **Information about storage in one common storage facility:** Store away from foodstuffs.
· **Further information about storage conditions:** Keep receptacle tightly sealed.
· **7.3 Specific end use(s)** No further relevant information available.

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SECTION 8: Exposure controls/personal protection

· **Additional information about design of technical systems:**
It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen-deficient environment.
Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment).
Use only appropriately classified electrical equipment and powered industrial trucks.

· **8.1 Control parameters**
WEL Long Term (8hr TWA) Inhalable dusts: 10mg/m3
WEL Long Term (8hr TWA) Respirable dusts: 5mg/m3
· **Components with limit values that require monitoring at the workplace:**
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.
· **Additional information:** The lists that were valid during the creation were used as basis.

· **8.2 Exposure controls**
· **Personal protective equipment**
· **General protective and hygienic measures**
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing
Wash hands before breaks and at the end of work.
Avoid contact with the eyes and skin.
· **Breathing equipment:**
For nuisance exposures use types P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate governement standards such as NIOSH (US) or CEN (EU).

In case of brief exposure or low pollution use respiratory filter device. In case of intensive or longer exposure use respiratory protective device that is independent of circulating air.

· **Protection of hands:**
Protective gloves.
I.E., Nitrile, Viton, Neoprene
The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation
· **Penetration time of glove material**
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
· **Eye protection:**
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Tightly sealed goggles.
· **Body protection:** Protective work clothing.

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SECTION 9: Physical and chemical properties

· **9.1 Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Powder
Colour:	Light beige
· **Odour:**	Characteristic
· **Odour threshold:**	Not determined.
· **pH-value at 20 °C:**	6-7 (1% aqueous)
· **Change in condition**	
Melting point/Melting range:	198 °C (*)
Boiling point/Boiling range:	undetermined
· **Flash point:**	Not applicable
· **Flammability (solid, gaseous)**	Not determined.
· **Ignition temperature:**	
Decomposition temperature:	Not determined.
· **Self igniting:**	Product is not selfigniting.
· **Danger of explosion:**	As with all dusts, fine particles suspended in air in critical proprtions and in the presence of an ignition source may ignite and/or explode. Dust may be sensitive to ignition by electrostatic discharge, electrical arcs, sparks, welding torches, cigarettes, open flame, or other significant heat sources. As a precaution, implement standard safety measures for handling finely divided organic powders. Risk of explosion by shock, friction, fire or other sources of ignition.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapour pressure:**	Not applicable.
· **Density:**	Not determined
· **Relative density**	Not determined.
· **Vapour density**	Not applicable.
· **Evaporation rate**	Not applicable.
· **Solubility in / Miscibility with**	
Water at 20 °C:	200 g/l (*)
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
dynamic:	Not applicable.
kinematic:	Not applicable.
· **9.2 Other information**	The above data are typical values and do not constitute a specification. *Properties have been calculated.

SECTION 10: Stability and reactivity

· **10.1 Reactivity** No further relevant information available.

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· **10.2 Chemical stability**
· **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
· **10.3 Possibility of hazardous reactions** No dangerous reactions known
· **10.4 Conditions to avoid** No further relevant information available.
· **10.5 Incompatible materials:** Strong oxidizing agents; alkalis/bases
· **10.6 Hazardous decomposition products:** Ammonia, in wet conditions

SECTION 11: Toxicological information

· **11.1 Information on toxicological effects**
· **Acute toxicity** Based on available data, the classification criteria are not met.
· **LD/LC50 values that are relevant for classification:** LD50 5,000 mg oral Rat
· **Primary irritant effect:**
· **Skin corrosion/irritation**
Causes skin irritation.
· **Serious eye damage/irritation**
Causes serious eye irritation.
· **Respiratory or skin sensitisation** Based on available data, the classification criteria are not met.
· **CMR effects (carcinogenity, mutagenicity and toxicity for reproduction)**
· **Germ cell mutagenicity** Based on available data, the classification criteria are not met.
· **Carcinogenicity** Based on available data, the classification criteria are not met.
· **Reproductive toxicity** Based on available data, the classification criteria are not met.
· **STOT-single exposure**
May cause respiratory irritation.
· **STOT-repeated exposure** Based on available data, the classification criteria are not met.
· **Aspiration hazard** Based on available data, the classification criteria are not met.

*
SECTION 12: Ecological information

· **12.1 Toxicity**

· **Aquatic toxicity:**	
LC50/ 48 h	251 mg/l (Daphnia pulex (water flea)) (48 Hours)
	316 mg/l (Pimphales promelas) (48 Hours)
	138.9 mg/l (Scophthalmus maximus - Turbot) (48 Hours)
LOEC	1000 mg/l (Daphnia pulex (water flea)) (LOEC)
	300 mg/l (M. beryllina (Inland Silverside)) (LOEC)
	600 mg/l (Mysidopsis bahia) (LOEC)
	1000 mg/l (Pimphales promelas) (LOEC)

· **12.2 Persistence and degradability** biodegradable
· **12.3 Bioaccumulative potential** No further relevant information available.
· **12.4 Mobility in soil** No further relevant information available.
· **Additional ecological information:**
· **General notes:** Generally not hazardous for water.
· **12.5 Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.
· **12.6 Other adverse effects** No further relevant information available.

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SECTION 13: Disposal considerations

· **13.1 Waste treatment methods**
· **Recommendation**

Must not be disposed of together with household garbage. Do not allow product to reach sewage system.

· **European waste catalogue**
The European Waste Catalogue (EWC) waste codes do not refer to product but to origin. The manufacturer is therefore unable to quote a waste code for products which are used in various industries. Any codes shown should be regarded as a recommendation to the user.

07 00 00	WASTES FROM ORGANIC CHEMICAL PROCESSES
07 01 00	wastes from the manufacture, formulation, supply and use (MFSU) of basic organic chemicals
07 01 99	wastes not otherwise specified
HP 4	Irritant - skin irritation and eye damage
HP 5	Specific Target Organ Toxicity (STOT)/Aspiration Toxicity

· **Uncleaned packagings:**
· **Recommendation:** Disposal must be made according to official regulations.
· **Recommended cleansing agent:** Water, if necessary with cleansing agents.

SECTION 14: Transport information

· **14.1 UN-Number**	
· **ADR, ADN, IMDG, IATA**	Void
· **14.2 UN proper shipping name**	
· **ADR, ADN, IMDG, IATA**	Void
· **14.3 Transport hazard class(es)**	
· **ADR, ADN, IMDG, IATA**	
· **Class**	Void
· **14.4 Packing group**	
· **ADR, IMDG, IATA**	Void
· **14.5 Environmental hazards:**	
· **Marine pollutant:**	No
· **14.6 Special precautions for user**	Not applicable.
· **14.7 Transport in bulk according to Annex II of Marpol and the IBC Code**	Not applicable.
· **UN "Model Regulation":**	Void

(Contd. on page 8)

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 30.03.2016 Revision: 30.03.2016

Trade name: VpCI®-609

(Contd. of page 7)

SECTION 15: Regulatory information

· **15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

· **Directive 2012/18/EU**
· **Named dangerous substances - ANNEX I** None of the ingredients is listed.

· **National regulations**

· **Water hazard class:** Generally not hazardous for water.
· **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

SECTION 16: Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.
Cortec Corporation does not warranty any translation of this SDS not created by Cortec Corporation.
Refer to NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids, for safe handling.

· **Relevant phrases**
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H335 May cause respiratory irritation.
· **Abbreviations and acronyms:**
ICAO: International Civil Aviation Organisation
RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail)
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
IATA: International Air Transport Association
GHS: Globally Harmonised System of Classification and Labelling of Chemicals
EINECS: European Inventory of Existing Commercial Chemical Substances
ELINCS: European List of Notified Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
vPvB: very Persistent and very Bioaccumulative
Skin Irrit. 2: Skin corrosion/irritation, Hazard Category 2
Eye Irrit. 2: Serious eye damage/eye irritation, Hazard Category 2
STOT SE 3: Specific target organ toxicity - Single exposure, Hazard Category 3
· *** Data compared to the previous version altered.**

Reducing Heat Exchanger Fouling and Metallic Corrosion with Vapor Infusion Technologies

Michael Radicone, Specialty Products Lead, HTRI

HTRI®

Numerous studies indicate there are benefits of using aeration within a heat exchange device;

Enhancement of heat transfer due to bubbles passing through a narrow vertical rectangular channel.
Monde, M

Thermal performance improvement by injecting air into water flow
Shyy WoeiChang Bo-JyunHuang

Heat transfer enhancement due to air bubble injection into a horizontal double pipe heat exchanger.
Hamed_Sadighi_Dizaji

Heat Transfer Enhancement Caused by Sliding Bubbles.
Bayazit

"Vapor and gas bubbles are known to increase heat transfer rates from adjacent heated surfaces, a phenomenon attributed to the interaction between the bubble and the thermal boundary layer."

Dynamic Flow Structures in the Wakes of Sliding Bubbles for Convective Heat Transfer Enhancement
Donnelly, Persoons, Murray

Effects of bubble size on heat transfer enhancement by sub-millimeter bubbles for laminar natural convection along a vertical plate.
Kitagawa, Uchida, Hagiwara

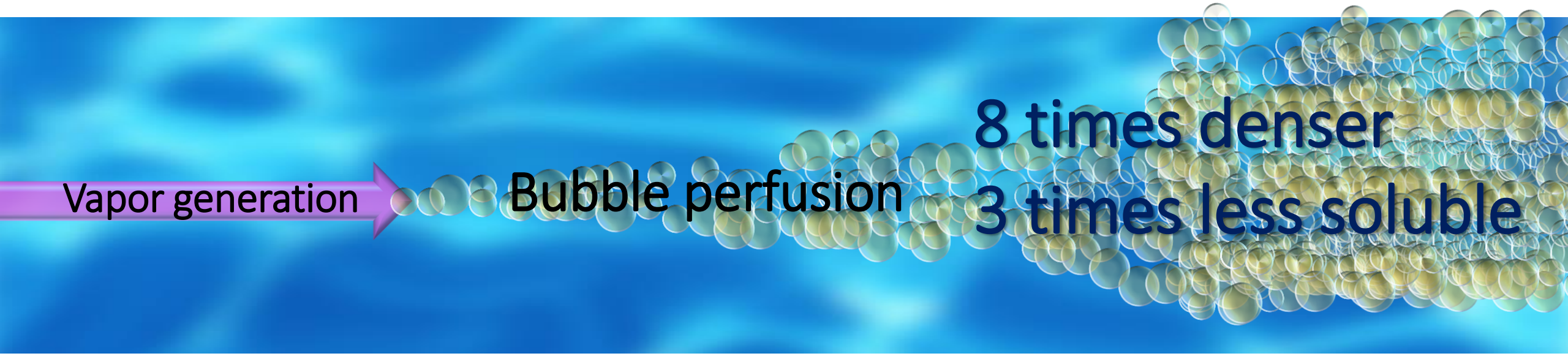
Decreasing the Scale Fouling of Heat Exchanger Plates Using Air Bubbles.
Baek, Seol, Lee, Yoon

Unfortunately, aeration of cooling water can introduce **dissolved oxygen** through mass transfer **inducing corrosion or accelerated biofouling**

Vapor Infusion Technology allows for Aeration with reduced oxidation while providing BVT (Bubble Vapor Treatment).

Vapor infusion is a patented process that safely generates SCRUBBING, transitory bubbles to reduce the formation of foulants on heat exchanger surfaces while imparting targeted and reduced chemical treatments.

When using iodine vapor, the bubbles are denser, heavier and less soluble than air bubbles.



These bubbles have a low oxygen and chemical treatment vapor core and an aqueous reactive surface that;

- present a reduced treatment volume
- inhibits corrosion
- mechanically disrupts foul formation
- reduces sedimentary action

- works during function; CIP, Teardown, Sponge ball
- pulsed, air/fluid proportioning
- adaptable to any environment
- Uses only grams per application

ESTCP study compared two similar heat exchangers onboard a working Navy test ship. One received infusion at 3 minutes every half hour and was compared to a non-infused control. There was no release of metal or non metallic ions during infusion and a complete inhibition of bio-fouling.

Success criteria	**Actual outcome**
A **50%** increase between acid cleanings from 60 days to 90 days.	**270 days* End of study.**
Less than **200** ppb increase in iodine in effluent.	Only **35** ppb increase.
Low increase in metallic ions during infusion.	**No** increase.

No difference in temperature and pressure before and after a final acid wash, indicating zero biofouling.*

***Reduction in cleaning time by 50% and hazardous waste generated.*

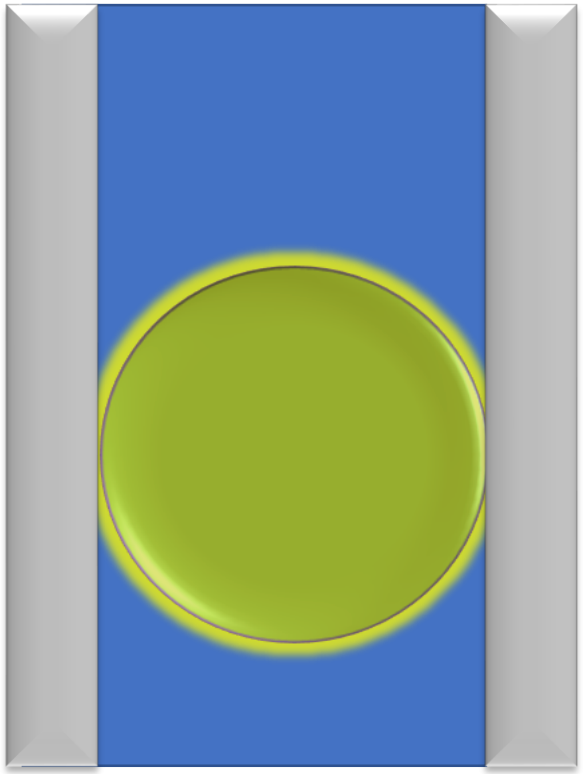
- Infusion duration was only 3 minutes per half hour, and total monthly cartridge iodine loss was less than 20 grams.
- The infused exchanger was used 85% of time and still exhibited no bio-fouling.

Dynamic bubble sparging with reduced oxygen presence and BVT

Minerals and Mud
Metals
Macro fouling agents
in the device fluid

BVT provides for both the gaseous and aqueous presentation of the treatment chemical on the bubble surface.
Gas solubility provides for the presentation of the chemical treatment into the fluid surrounding the bubble.

Minerals and Mud
Metals
Macro fouling agents
on the device surfaces



Research performed at WSU and Cornell proves the effectiveness of bubble surface vapor transfer and its potential for reduced residue.

The results of one 90 second infusion results in a complete reduction.

Bacteria	Initial Concentration (Log CFU/mL)	Final Concentration (Log CFU/mL)
E. Coli K12	6.12	0.00
E. Coli O157:H7	6.48	0.00
Salmonella	6.28	0.00
Enterococcus	6.56	0.00

Disinfection occurs rapidly.

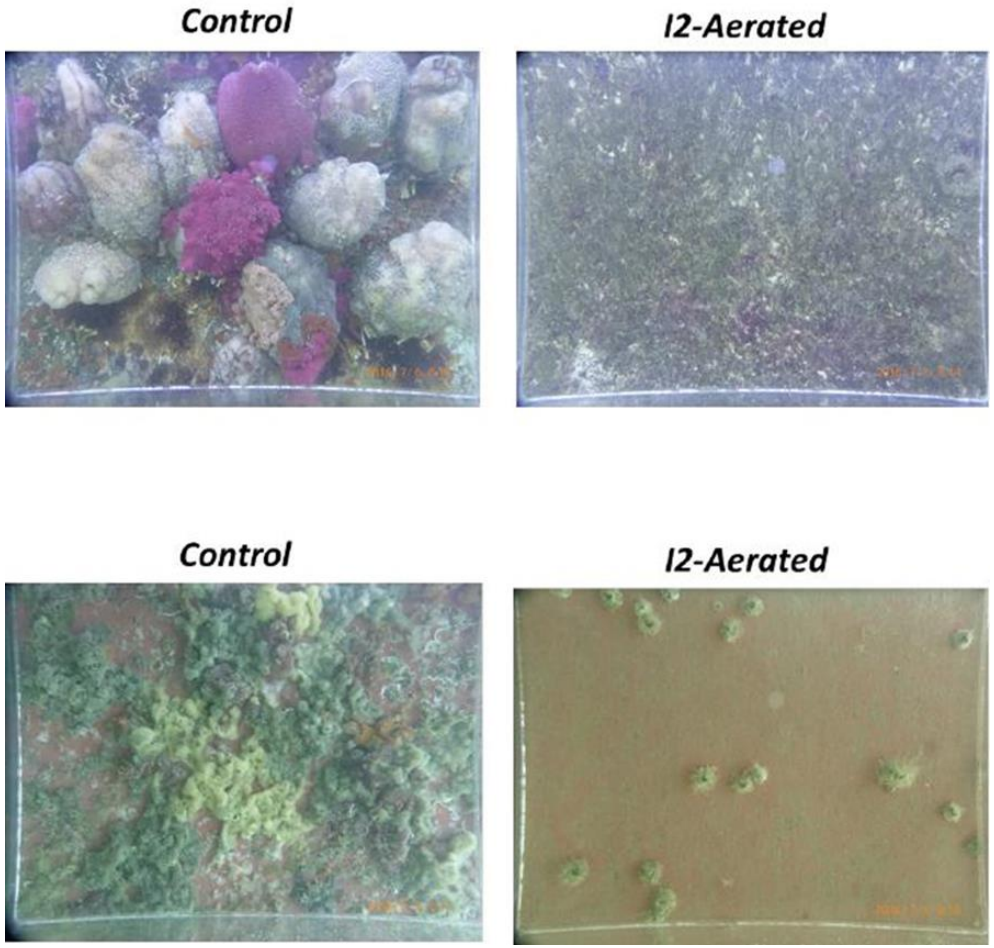
Time (sec)	cfu/ml
control	7,200,000
15	tntc
30	tntc
60	0
90	0
120	0

Minimal residue.

After a 90 second infusion there was less than 50 ppb residue in the fluid volume.

Ship hull hard foul prevention; iodinated air and control-3 year study

Naval Undersea Warfare Center Division and Florida Institute of Technology



"Early observations indicate an inhibitory effect on the growth cycle of some fouling species, as well as on the surface bonding capabilities of barnacles. Water sampling analysis indicated ***no change in sea water iodine levels*** *during full iodine infusion compared to ambient sea water."*

ESTCP study compared two similar heat exchangers onboard a working Navy test ship. One received infusion at 3 minutes every half hour and was compared to a non-infused control. There was no release of metal or non metallic ions during infusion and a complete inhibition of bio-fouling.

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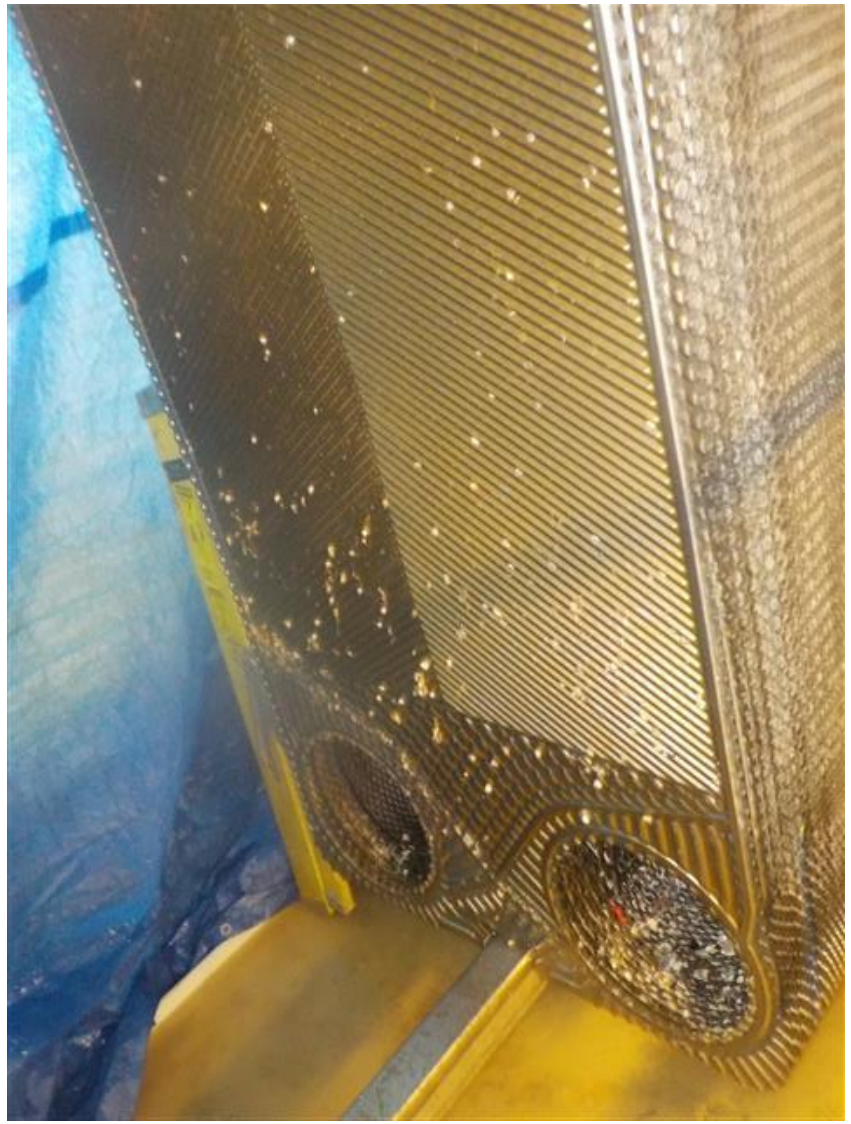
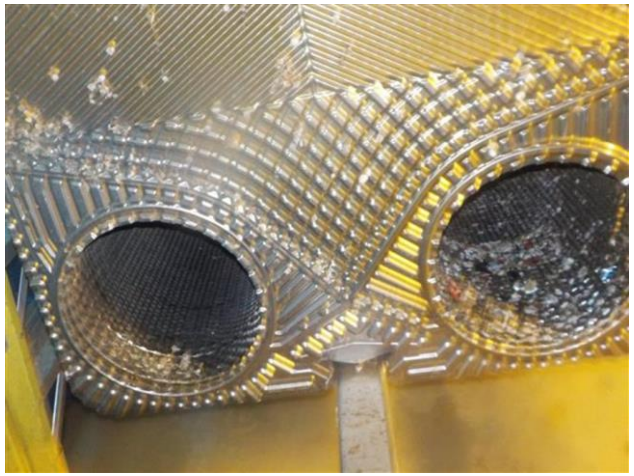
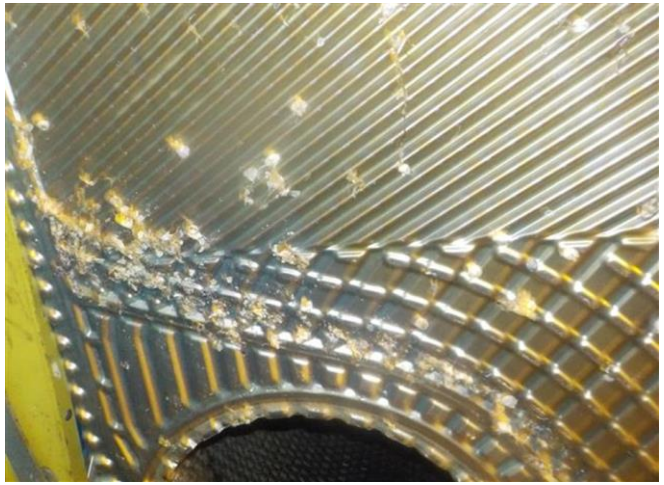
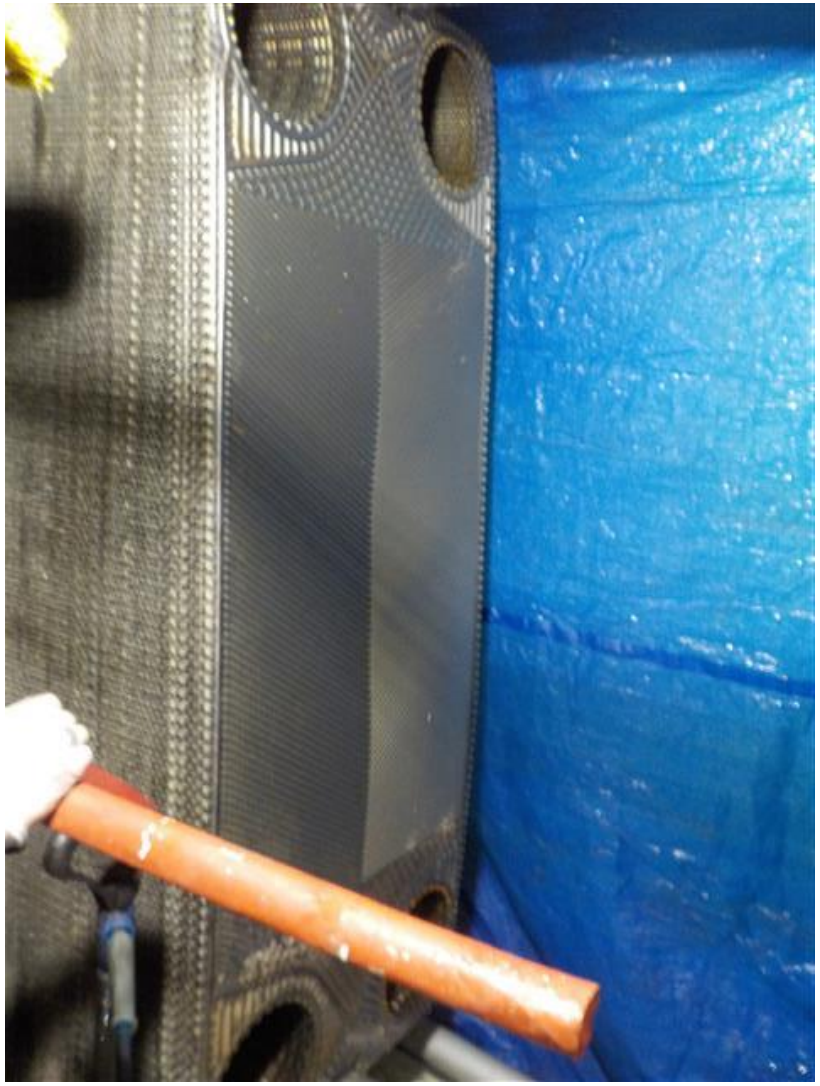
Fouled Engine cooler NCL Sun after 14 month infusion

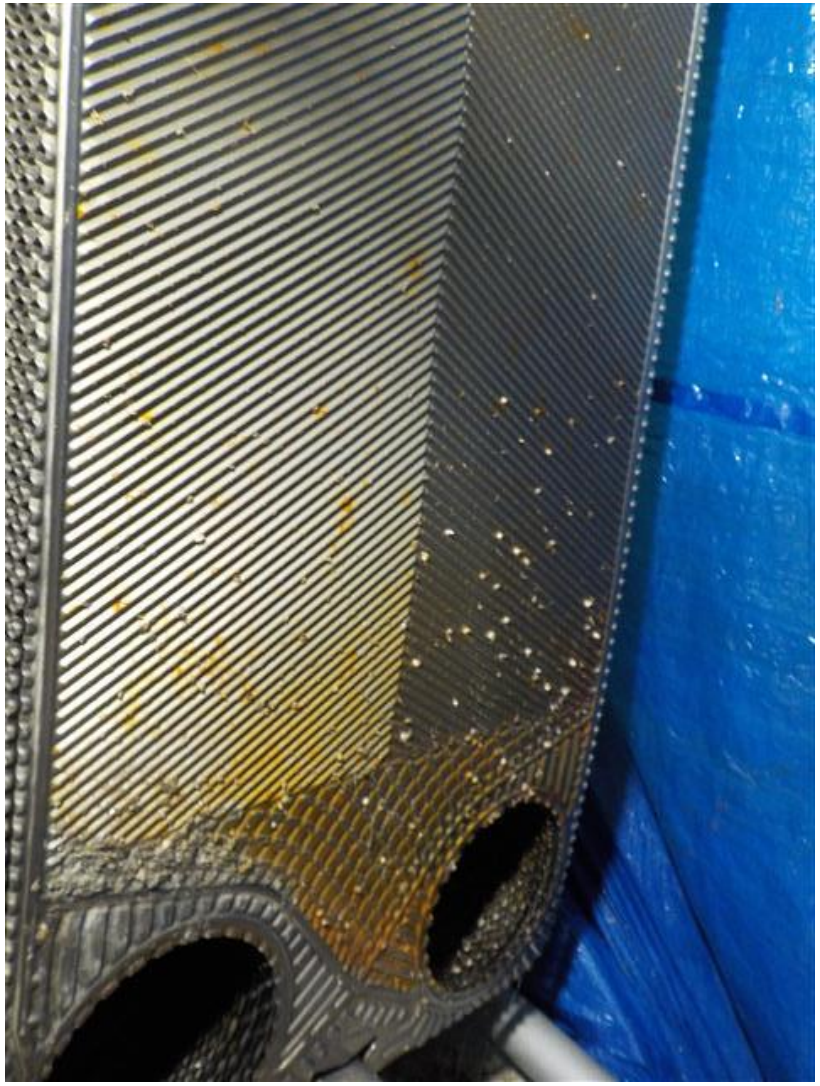






Fouled Engine cooler NCL Sky after 14 month infusion





Vaporous treatments:

- Benzoate salts

Ferrous and aluminum corrosion inhibition

Macro foul disruption

Oxygen scavenging

Void and containment corrosion inhibition

- Benzotriazole

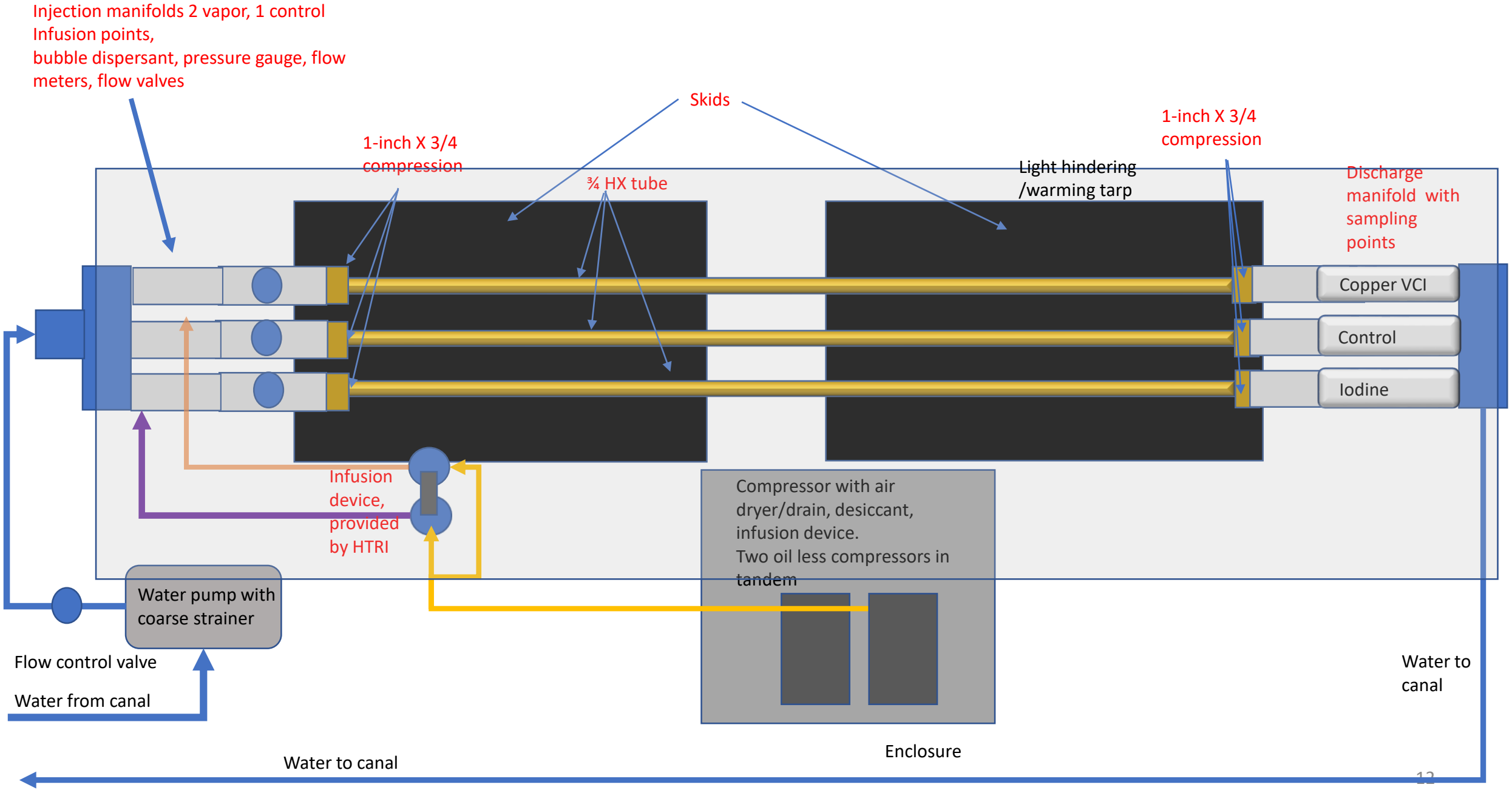
Ferrous and cupreous corrosion inhibition

Macro foul disruption

Void and containment corrosion inhibition

Oxygen scavenging

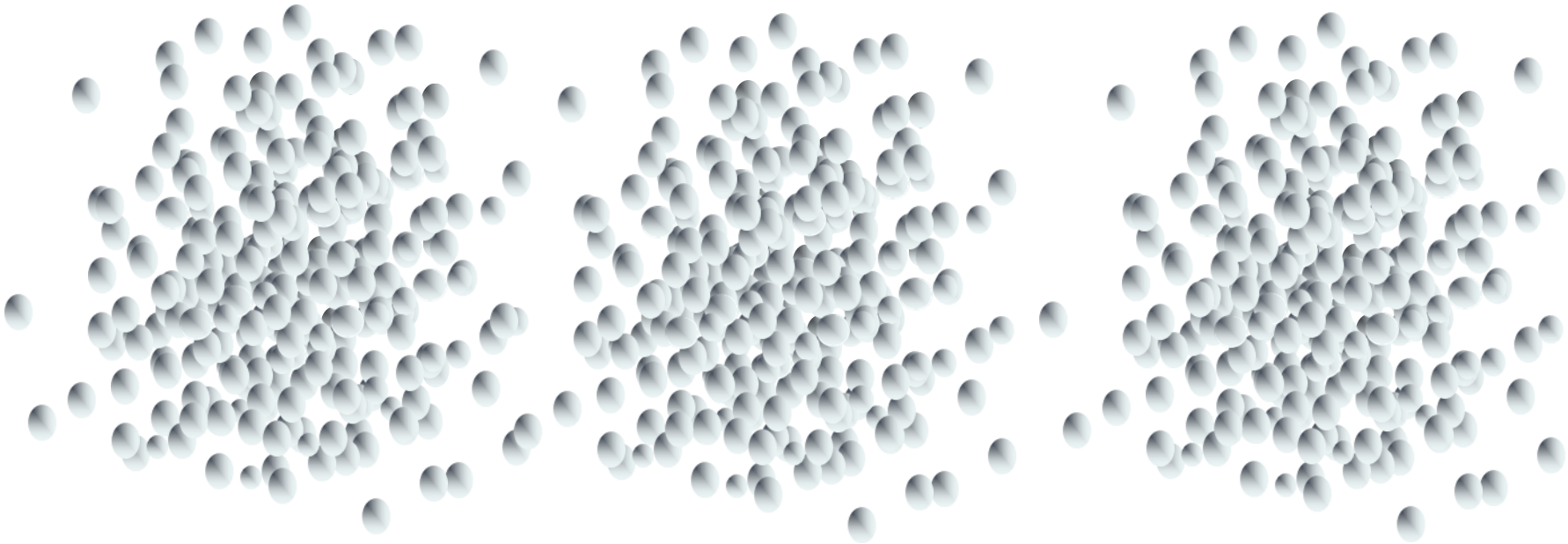
- Iodine Vapor
- Bio-organic catalyst


Injection manifolds 2 vapor, 1 control
Infusion points,
bubble dispersant, pressure gauge, flow meters, flow valves
Skids
1-inch X 3/4 compression
¾ HX tube
Light hindering /warming tarp
1-inch X 3/4 compression
Discharge manifold with sampling points
Copper VCI
Control
Iodine
Infusion device, provided by HTRI
Compressor with air dryer/drain, desiccant, infusion device.
Two oil less compressors in tandem
Water pump with coarse strainer
Flow control valve
Water from canal
Water to canal
Enclosure
Water to canal

NCL cruise ship sea chest and seawater systems.

Pulsed Iodine Ultra-fine* microbubbles with or without Aqua Cat post pumps.

*Idec Ultrafine Bubbles



ENCLOSURE 2 TO

L-2019-204

FLORIDA DEPARTMENT OF Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Noah Valenstein
Secretary

November 20, 2019

SENT BY EMAIL TO:
(meghna.pandya@fpl.com)

Ms. Meghna Pandya
Environmental Specialist
Florida Power & Light Company (FPL)
700 Universe Blvd. (GTA/JB)
Juno Beach, Florida 33408

Re: Florida Power & Light Company
Turkey Point Power Plant
NPDES Permit No. FL0001562
90-Day Trial Approval

Dear Ms. Pandya:

The Florida Department of Environmental Protection (Department) has received your request via email dated November 4, 2019 requesting authorization for a 90 day trial use of vapor infusion technologies to reduce heat exchanger fouling and corrosion for treatment of Units 3 and 4. The Department has determined that this activity would qualify as a minor modification to the operation of the Turkey Point Power Plant pursuant to Rule 62-620.200(24), Florida Administrative Code (F.A.C.), and can be authorized by a permit revision pursuant to Rule 62-620.325(2), F.A.C. This letter authorizes a trial period for 90 days beginning upon initial treatment.

Please provide three copies, or an electronic copy, of the testing results to the Wastewater Management Program in Tallahassee (epost.bwfriw@dep.state.fl.us). If you have any questions, please contact Frank Wall or me at (850)245-8589.

Sincerely,

Marc H. Harris, P.E.
Program Administrator
Wastewater Management Program
Division of Water Resource Management

MH/fw

Attachment

cc: Kent Edwards, FDEP West Palm Beach (kent.edwards@dep.state.fl.us)
Nancy Ross, FDEP Tallahassee (nancy.ross@floridadep.gov)