



# CT and HRSG Innovations



**VECTOR® HRSG Cleaning:**  
Offline HRSG Cleaning  
2-3 outage days/unit  
Intensive debris removal



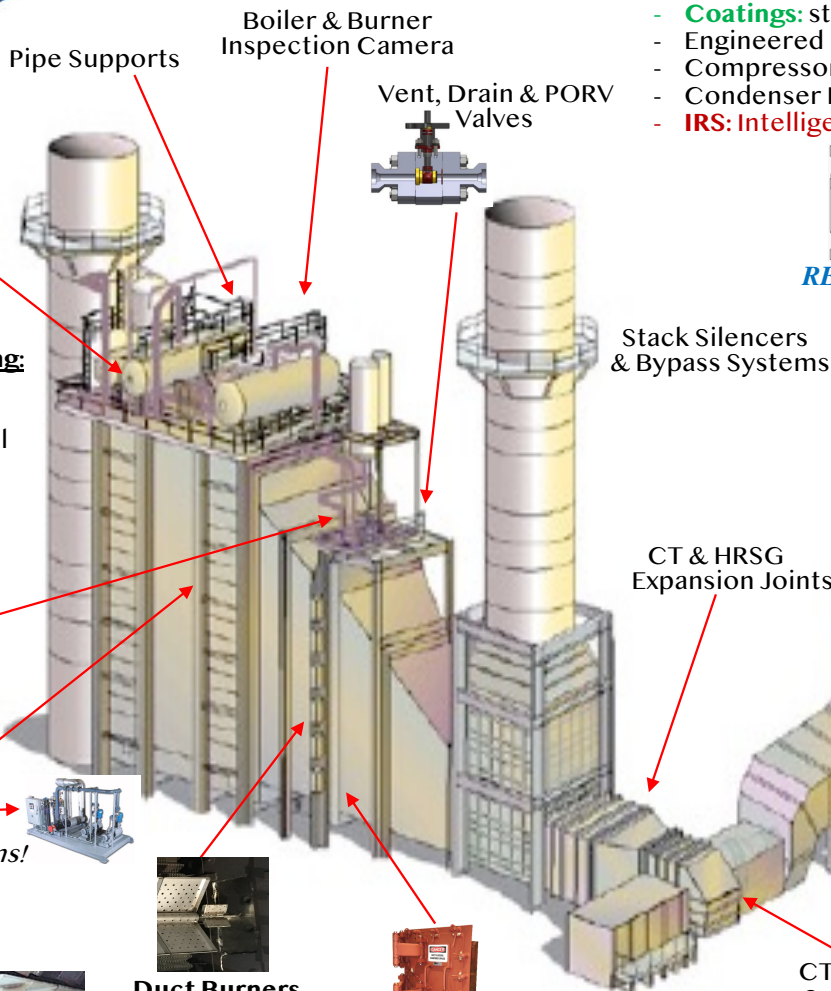
**SCR: Eliminate**  
*Electric Heaters & HGR Fans!*  
SCR & CO Catalyst  
SCR PreHeating



**Duct Burners**  
Igniters & Scanners  
Pilot Upgrades  
COEN Tips

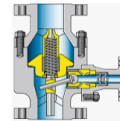


**Steam Turbine  
Packing & Seals**



## Other products & services:

- **Pumps:** Feedwater, Condensate & HRSG Recirc
- **Condenser:** online cleaning & Intake Filtration
- **Coatings:** stack, duct, condenser, tanks, etc
- Engineered Pipe Supports
- Compressor Wash Systems + Power Injection
- Condenser Eductors & Ejectors
- **IRS: Intelligent HRSG Recirculation System**

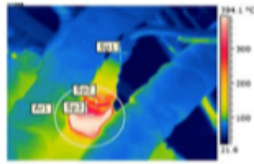


**RECIRCshield:** zero leakage system



# CT Upgrades:

## Ignition & Flame Scanners



### FIBER OPTIC FLAME SCANNER

*No liquid cooling required*

### Flame Scanners: GE & Mitsubishi BFI Fiber Optic Flame System

- ✓ Eliminate liquid cooling system
- ✓ Factory warranty: 2 years
- ✓ SIL level 3 (1 failure in 100M hours)
- ✓ Flexible: field switchable for any output
- ✓ Saves outage time: disassembly & storage
- ✓ Widely proven on 7FA & M501F
- ✓ Installs into existing fittings
- ✓ Typically 3-5 day installation time per turbine



### Ignition Upgrades: ALL Combustion Turbines Chentronics High Energy / Low Voltage



#### *SmartSpark Ignition System*

- High Energy Ignition
- Direct Ignition of #2 Oil
- Integral Diagnostics
- Low-Voltage Leads
- Highest Reliability
- Plug & Play Upgrade for:
  - Unison
  - DET-Tronics



# CT Upgrades:

## CT Inlet Air

### **AVOS+CAP: Combustion Air Preheating System**

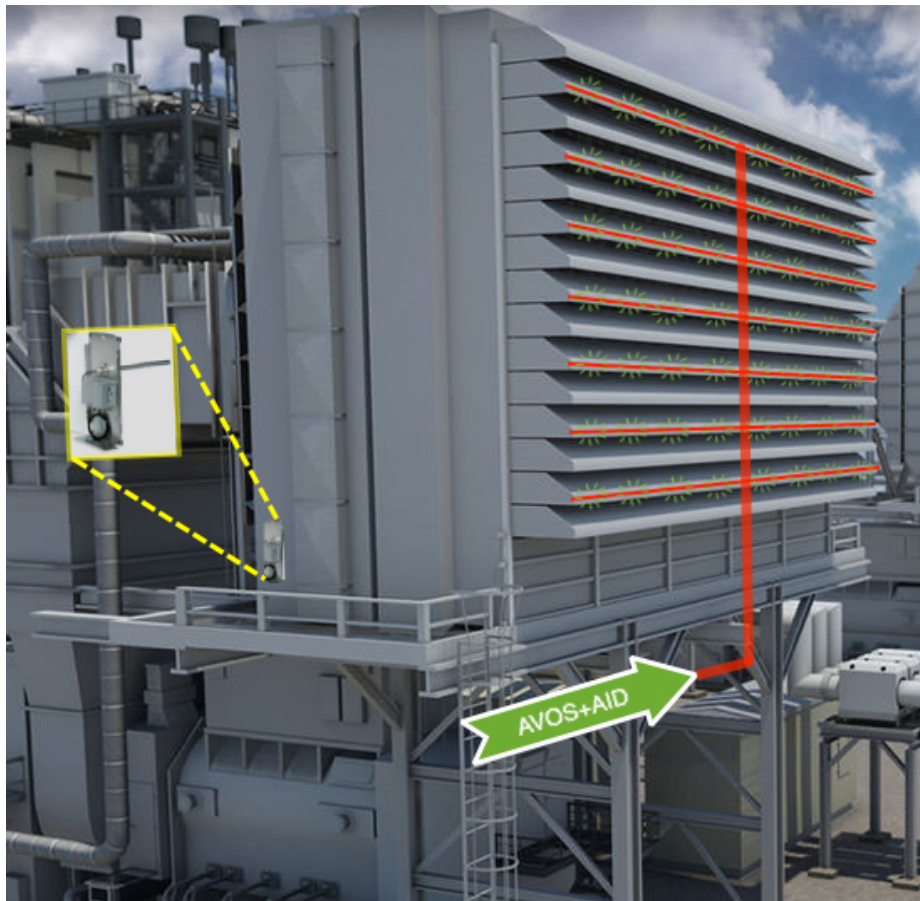
- ✓ Well documented efficiency gains: part-load CT operations (1.5%-5%)
- ✓ Utilizing Proprietary **AVOS+E<sup>3</sup>** Induced Flow thermal extraction process
- ✓ **AVOS+CAP** delivers controlled flow: 500F-800F Air => optimal heat energy
- ✓ Real Time Inlet Air Humidity & Temperature

### **AVOS+AID: Air Inlet De-Icing System**

- ✓ Utilizing Proprietary AVOS+E<sup>3</sup> Induced Flow CT exhaust heat exchanger
- ✓ AVOS+AID delivers controlled flow: 150F-300F Air => reducing dew point
- ✓ Real Time Inlet Air Frost-Point Monitoring

### **Air Filters: In-Kind Replacement for most OEMs**

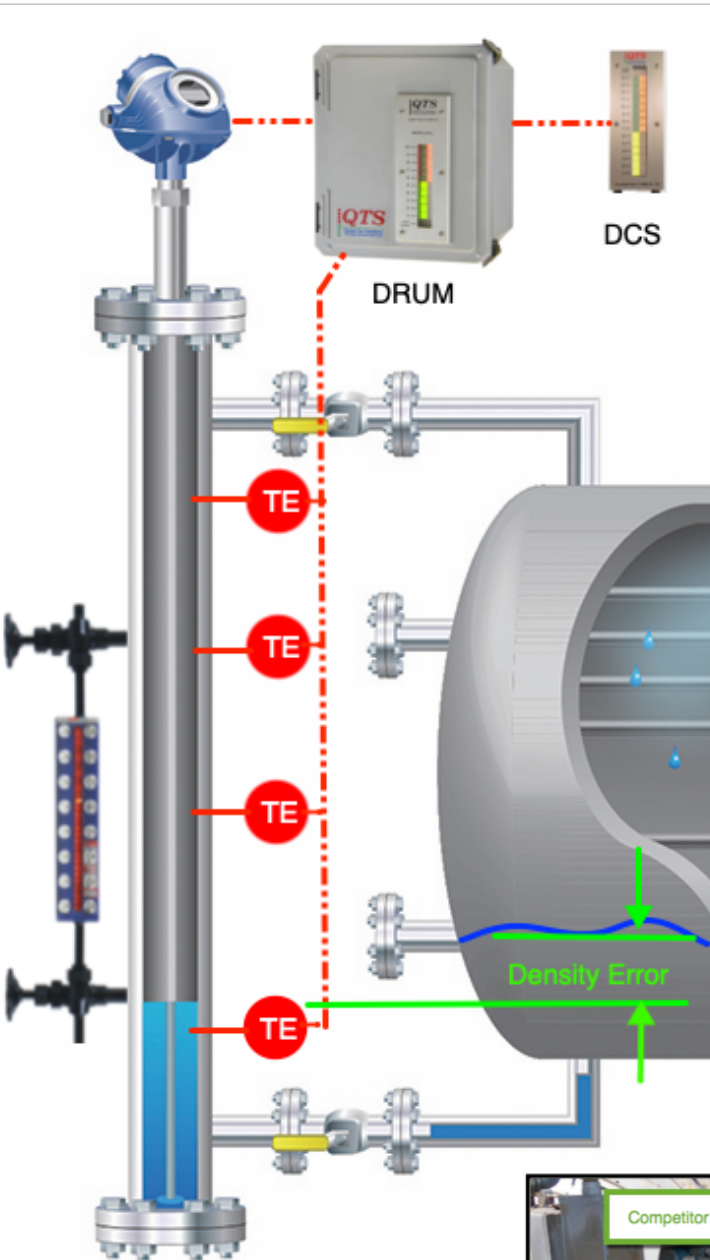
- ✓ Full Line of MERV and HEPA Ratings







# HRSG Upgrades: Steam Drum Level



## Remote Level Indicator:

### Conversion to QTS Guided Wave Radar:

- ✓ ASME Section 1 Code Compliant
- ✓ 99% maintenance free
- ✓ **Proprietary Density Error Compensation**
- ✓ More Stable & Reliable vs dP Transmitters
- ✓ Multiple Remote Indicators Possible
- ✓ Level Gage may be Isolated per ASME
- ✓ Re-use of Existing RLI Field Wiring
- ✓ Designed and built by QTS Level

## Drum Level Gage:

- ✓ Highest Grade Design Available Today
- ✓ Largest Sight Port Diameter
- ✓ LED Illuminator – Super Bright
- ✓ Single Piece Forged Body
- ✓ Inline Repairable Gage Valves
- ✓ Designed and Built by QTS Level



Competitor's bi-color gauge



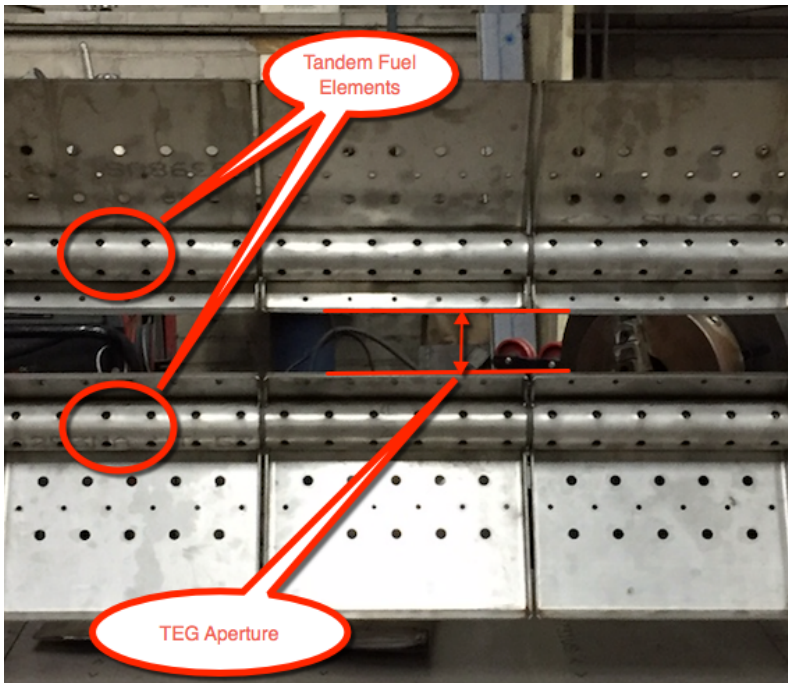
QTS bi-color gauge







# HRSG Upgrades: Duct Burners



## ***ALSTAM Duct Burners***

- ✓ Upgrade to RA-253MA
- ✓ Cryogenically Stress Relieved
- ✓ Thermally Stabilized
- ✓ Maximized Emissivity
- ✓ NOx Reduction with "HC" model
- ✓ Shortest Flame Length of any Design
- ✓ Upgrade any OEM In-Kind
- ✓ Increase Btu Input: up to 100%
- ✓ Eliminate Pilot Compressed Air
- ✓ Combustion Turbine Grade Igniters



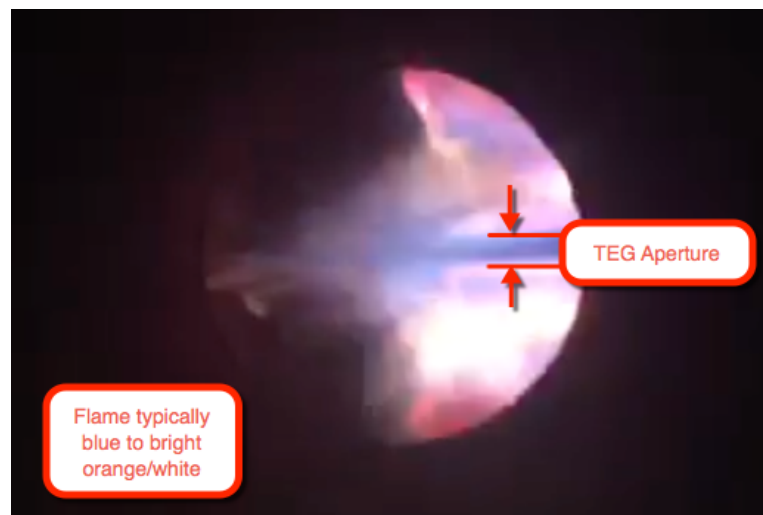
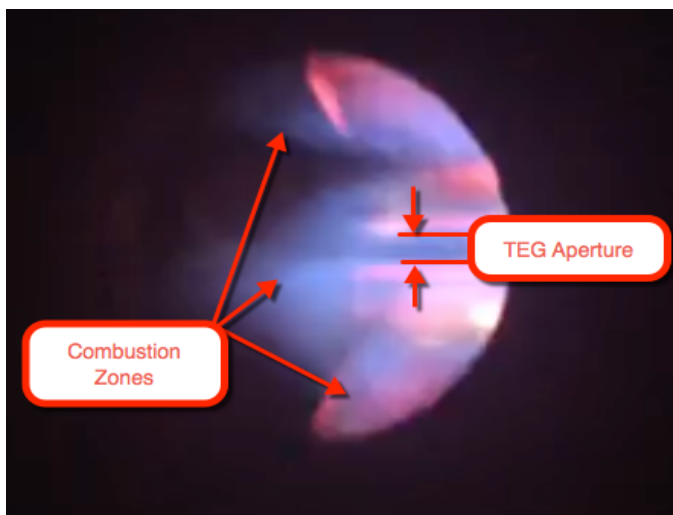
Flame Scanners



Igniters



Pilot Upgrades



## Utility & Industrial Boilers

### *iScan3 Flame Scanner Upgrade\**

- iScan2: Obsolete in 2021
- Plug & Play Upgrade
- More Compact & Ruggedized
- See Reverse for More Details

### *SmartSpark Igniter*

- HESI upgrade
- Integral Diagnostics
- Most Reliable Fuel Ignition
- Highly Adaptable



## HRSG Duct Burners

### *iScan3 Flame Scanner Upgrade\**

- iScan2: Obsolete in 2021
- Plug & Play
- More Compact & Ruggedized
- Re-Use Existing Cables
- Clear “Flame On” Indication



# HRSG Upgrades: ARC & Recirc Valve Bulletproofing

## *RECIRCshield*

 *Eliminate Recirc Valve Seat Leakage*

 *Eliminate Recirc Valve Trim Erosion*

 *Improve System Reliability*

 *Improve Heat Rate*

 *Minimize Repair Costs*

### *RECIRCshield* features:

- ✓ Suitable for ALL ARC & Recirc Valves
- ✓ Retains 100% of OEM Valve Components
- ✓ *RECIRCshield* Operates Autonomously
  - > Fine-Tuned to Each Pump System
- ✓ Minimal Installation Modifications
- ✓ Provides Valuable Pump Operating Data
- ✓ Inline Repairable: no special tools or techs
- ✓ Fail-Safe Design

**+ 2 Year Zero Leakage Warranty**

- Patent Pending – PTS Power, Inc -







# HRSG Upgrades: Ammonia Vaporization AVOS+E<sup>3</sup>

Ammonia Vaporization Optimization System

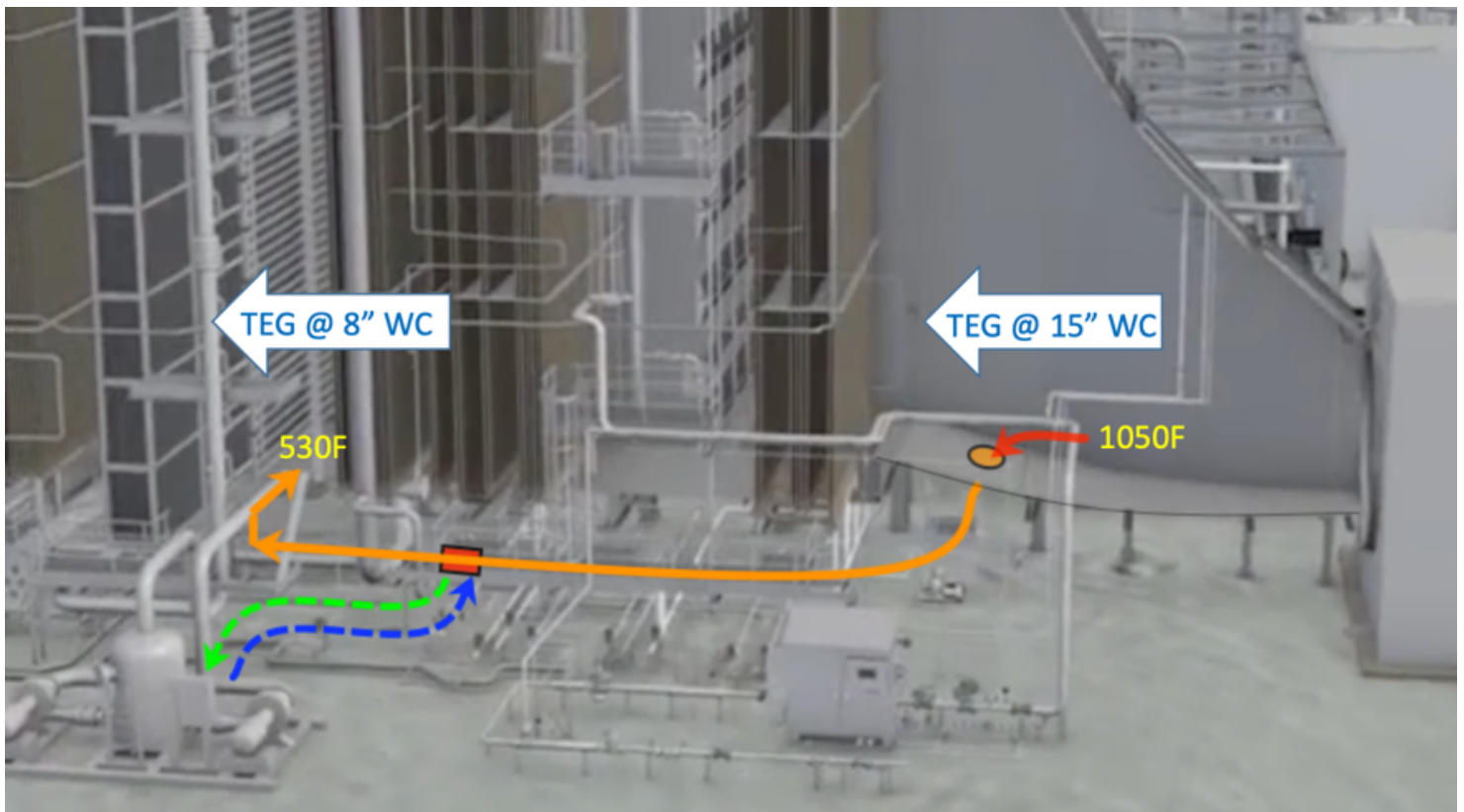
- ✓ Eliminate electric vaporization heaters
  - ✓ Eliminate hot gas recirc fans
  - ✓ 95%+ Parasitic Load Reduction
- ✓ Improved ammonia vaporization = reduced slip

Re-Uses Existing Ammonia Skid

*Retain Existing:* Electric Heaters or HGR Fans for 100% Redundancy

Catalyst Pre-Heat Function (reduce start-up time)

Catalyst Heating Function (restore part-load emission performance)





# HRSG Upgrades:

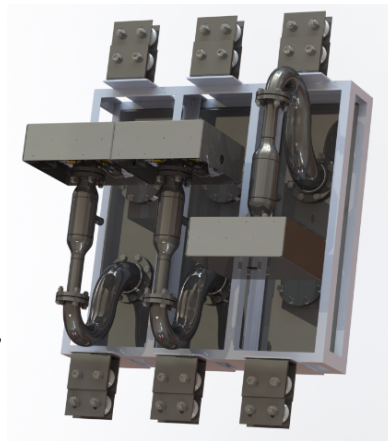
## Offline HRSG Cleaning

### VECTOR HRSG cleaning system

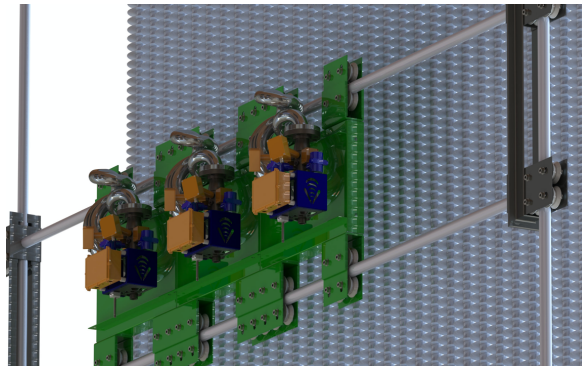
- ✓ Intensive deep HRSG tube bundle cleaning
- ✓ Remotely operated – no personnel inside HRSG
- ✓ Proven shock pulse detonation technology
- ✓ SAFE for HRSG components: tubing, seals & casing
- ✓ Modular & flexible for all HRSG widths & heights
- ✓ Quick mob & demob: 2-3 days to clean an HRSG
- ✓ Developed & field proven by the PTS Power team
- ✓ Operated by qualified & trained personnel



*Removes deep agglomerations*



*Modular*



*- Patent Pending -*



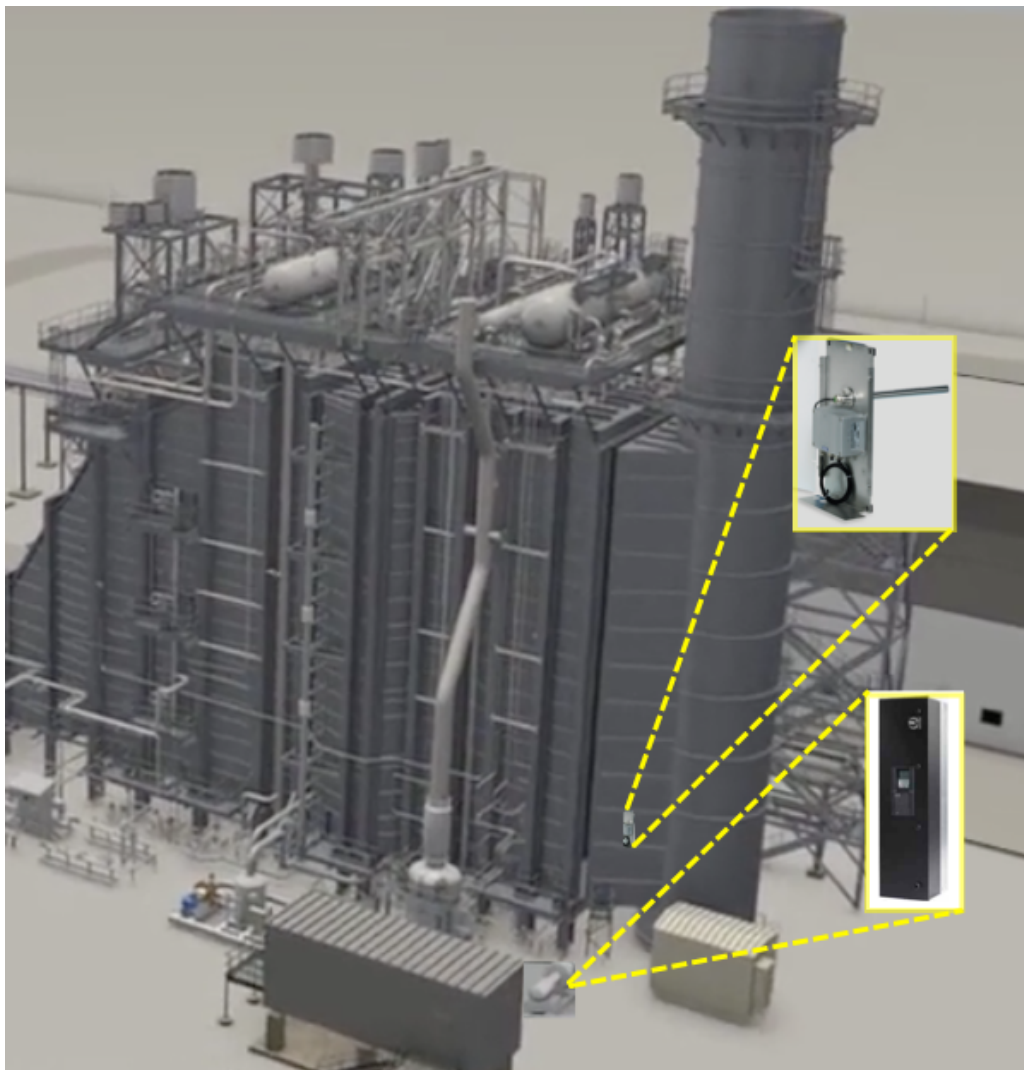




# HRSG Upgrades:

## HRSG Intelligent Recirculation

- ✓ *Real-Time HRSG Exit Dew Point & Temperature*
- ✓ *VFD Pump Upgrade - PID Dew Point Dew Point Control*
- ✓ *Maximizes LP Boiler Efficiency*
- ✓ *Control as Low as Dew Point +5F*
- ✓ *Operation of HRSG Recirculation System in “AUTO”*
- ✓ *Optional: CT Inlet Humidity & Temperature measurement*



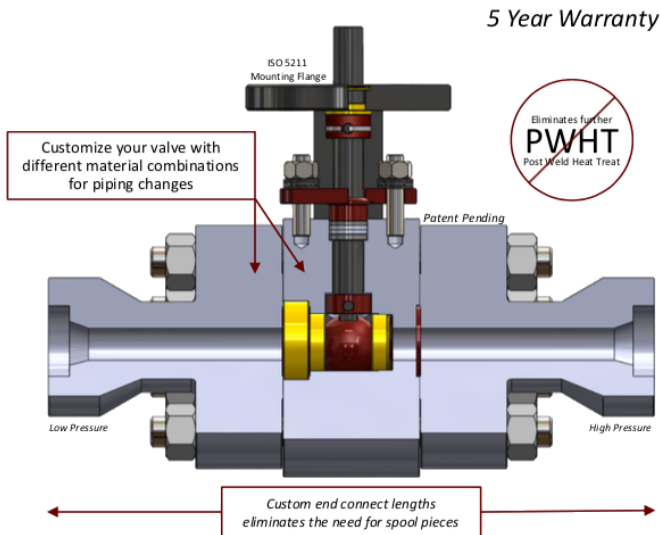
**Reference Installation: 7FA / Triple Pressure HRSG**

**- First Year Operation: \$80K per HRSG increased kWE revenue**





# HRSG Upgrades:



5 Year Warranty

## In-Line Repairable Ball Valve

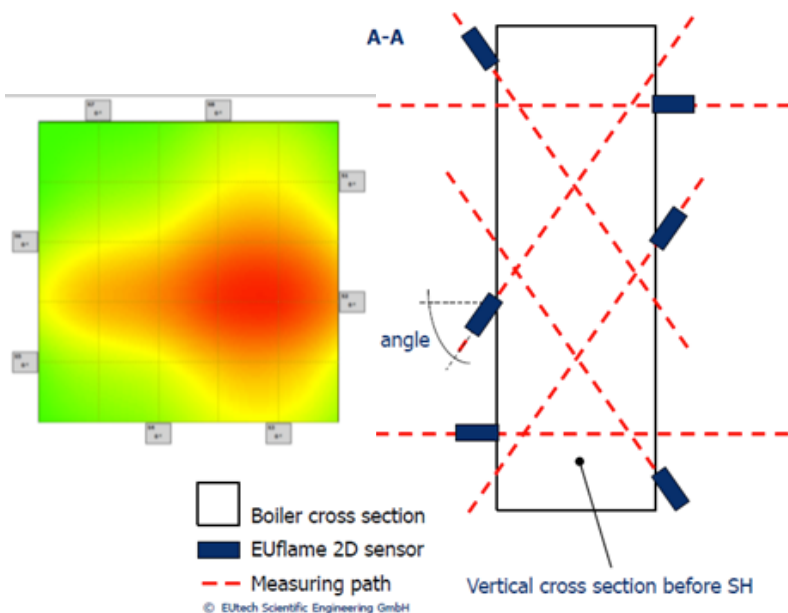
- ✓ Up to 4500# class / F91 & F92
- ✓ No Special Tools required to repair
- ✓ Combine materials: F91 in / F22 out
- ✓ Eliminate repeated cutting & welding
- ✓ Vents, drains & general isolation
- ✓ 3 year warranty (renewed upon rebuild)
- ✓ 100% USA made by Remington Valve

## P&I HRSG Access Doors

- ✓ Any size and temperature
- ✓ Side wall and roof access
- ✓ Designed for quick access
- ✓ Sealing is reliable and repeatable



6 Sensors – 2 boiler walls



## Duct Burner Combustion Camera

- ✓ Designed for any size HRSG
- ✓ 2-Dimensional temperature profile
- ✓ Thermal distribution
- ✓ Balance burner heat input
- ✓ Reduce or eliminate hot spots
- ✓ Balance NOx and CO distribution

**SCOTT BAUMANN**  
[SCOTT@PTSPower.COM](mailto:SCOTT@PTSPower.COM)  
HUDSON, WISCONSIN  
612-325-0756



**MATTHEW SMITH**  
[MATTHEW@PTSPower.COM](mailto:MATTHEW@PTSPower.COM)  
FOREST LAKE, MINNESOTA  
651-366-1598

## Valves

### **REMINGTON VALVE**



[RemingtonValve.com](http://RemingtonValve.com)

High-performance ball valve designs:  
**Vents \* Drains \* Isolation**  
**Power Operated Relief \* ERV**



## HRSG - Boiler

[Hamon.com](http://Hamon.com)

HRSGs & Boiler Parts, Inspections, Upgrades, Performance  
Audits & HRSG Redesign;



[AnvilIntl.com](http://AnvilIntl.com)

Custom engineered pipe supports; in-kind replacement for  
Bergen and other OEMs; pipe support & hangar inspections



[FluxDrive.com](http://FluxDrive.com)

Custom engineered magnetic couplings & VFD upgrades;  
Eliminate alignment issues – Eliminate **vibration** issues

## Duct Burner



[AlstamLLC.com](http://AlstamLLC.com)

**New High Capacity Ultra Low-Nox DB**

**Pilot upgrades** for: Forney, Coen, Zeeco & all others  
**Flames Scanner**, **HEI** spark igniters and **BMS** upgrades

## Pumps & Condenser



[PTSPower.com](http://PTSPower.com)

Upgrade ARC valve system: zero leakage & maximum reliability



[Taprogge.com](http://Taprogge.com)

Online condenser tube cleaning & 316b intake screens



[Torishima.com](http://Torishima.com)

**Boiler feedwater, Condensate and Circ water pumps**  
**Full Service Pump Repair Facility: Battle Creek, Michigan**

## Repair & Protective Coatings



[AdvancedFRPSystems.com](http://AdvancedFRPSystems.com)

Protective coatings: CT Intake through the stack; tanks, etc

## Combustion Turbine

### AmericanAirFilter

[aafintl.com](http://aafintl.com)

- Canister & Static Air Filters (MERV 10 to true HEPA E12)
- Inlet Air Cooling: Fogging / Evap Coolers / Chiller Systems
- Acoustic Enclosures



[VAWSystems.com](http://VAWSystems.com)

**Intake & Exhaust Systems & Silencers**  
**Fan & other silencer applications**

## Flame Scanners & Igniters



[BFI-Automation.de/en](http://BFI-Automation.de/en)

Fiber Optic Head – SIL Level 3 rated – ALL combustion turbines  
Replace **COEN** and **FORNEY** for duct burner applications



[Chentronics.com](http://Chentronics.com)

High integrity spark ignition for all fuel types and all Combustion  
Turbine models.

## CEMs

[AltecUSA.com](http://AltecUSA.com)



Nox, CO, Ammonia Slip  
Mercury + most others  
Stack or Duct: TDL, Sorbent Traps, etc

## Steam Turbine

[ReliableTurbine.com](http://ReliableTurbine.com)



Open/Clean/Inspect/Close  
Spare Parts for most ST OEMs  
In-place valve repair



[StarTurbine.com](http://StarTurbine.com)

Traditional steam turbine packing & seals  
Upgrades for retractable and sensitized packing

## SCR & CO Catalyst

[CatalyticCombustion.com](http://CatalyticCombustion.com)



CO Catalyst & SCR Catalyst: *In-kind or Upgraded*  
Dual Function or Single Function Catalyst; Turn-Key R&R  
Ammonia Vaporization Skids: electric, hot gas or AVOS+



[PTSPower.com](http://PTSPower.com)

Multiple designs to eliminate electric heaters & HGR fans

## Instrumentation

[QTSLevel.com](http://QTSLevel.com)



**Guided Wave Radar** - Steam Drum & Tank Level Gauges  
Spare Parts & Upgrades: Clark Reliance, Yarway, Diamond