

MARINE VAPOR EMISSION CONTROL SYSTEMS

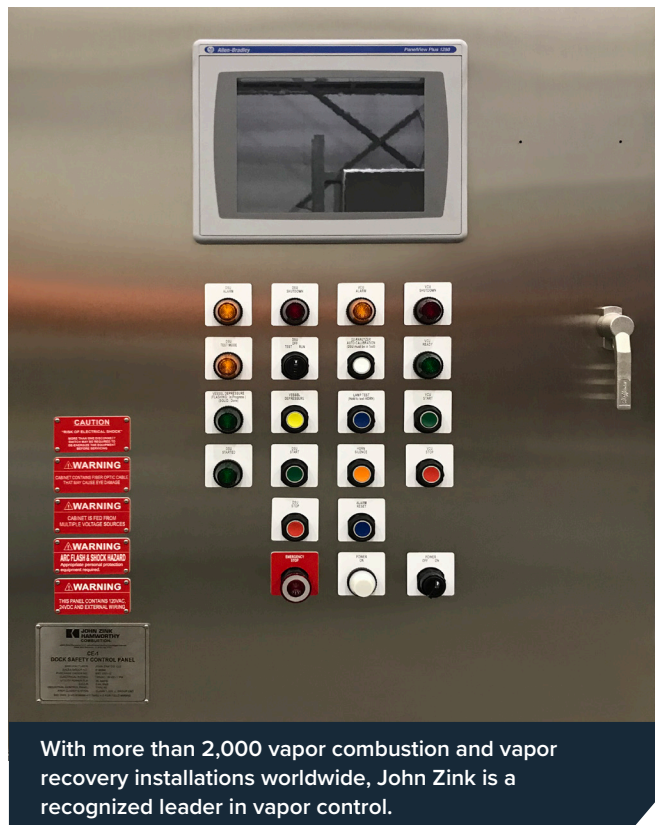
PROVEN WORLDWIDE

For decades, we've put our leadership in vapor control to work for marine applications, completing hundreds of marine terminal vapor control projects. We provide a full solution, from proven combustion and recovery systems, dock safety units, vapor blower units and integrated control systems to unmatched comprehensive support services.

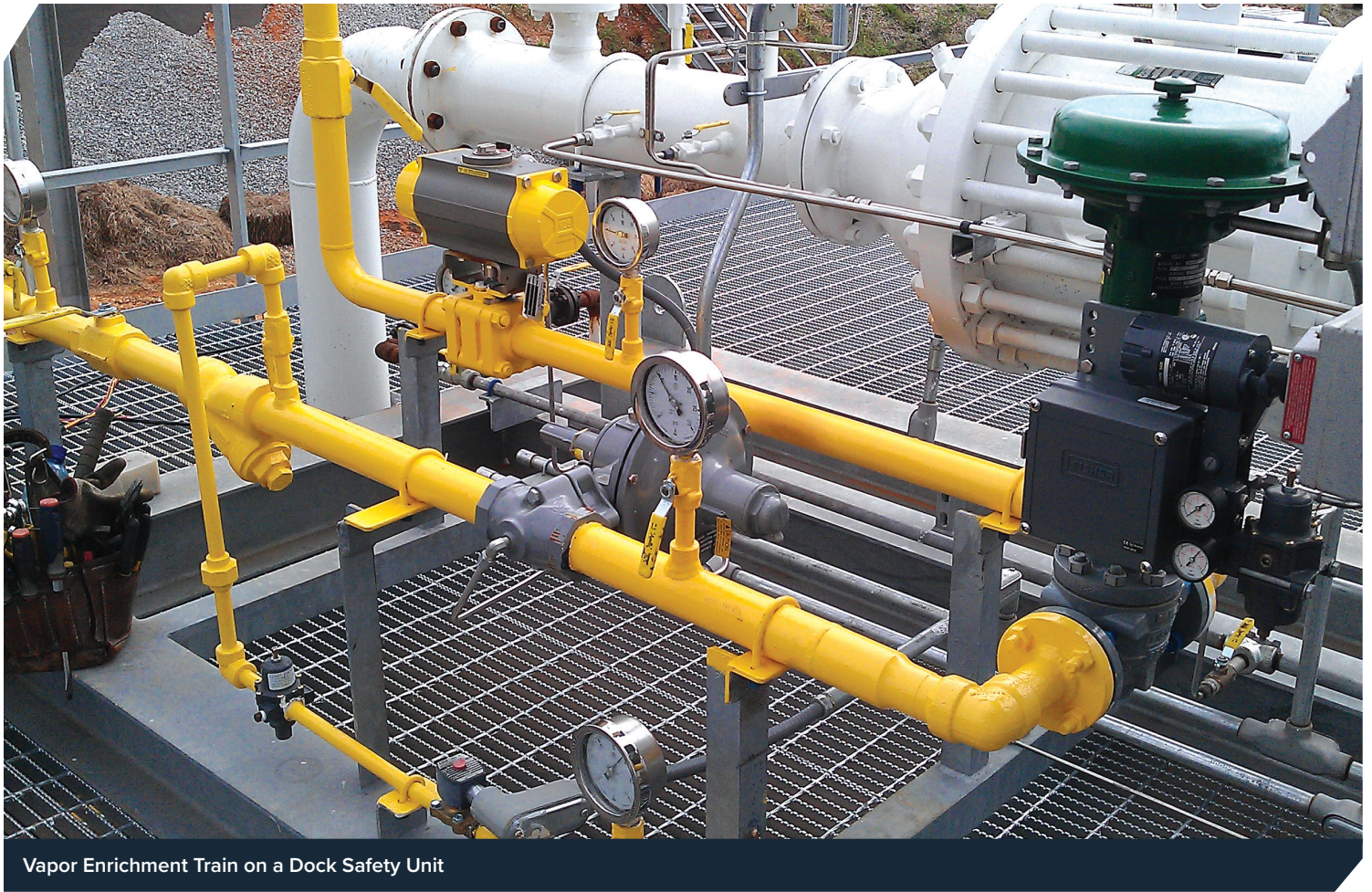
The Complete Package

With John Zink, you get the convenience of a single source of responsibility for the entire vapor control system. This single-source approach delivers a number of customer benefits including:

- A modular design allowing for specific customer requirements to be incorporated into any system
- Compatibility of the control system with all components
- Proven technology in every component
- Complete system checkout prior to delivery to assure 100% functionality and minimize on-site startup and certification time
- Assembly of modules on skids and prewiring to skid-edge terminal strips to eliminate expensive field construction and wiring costs
- Common spare parts throughout the system
- Comprehensive support services including:
 - Economic comparisons of the technologies
 - Engineering studies
 - Preliminary design and related cost estimates
 - Detailed system design
 - HAZOP review assistance
 - USCG certification assistance
 - Startup and performance testing
 - Preventive maintenance and emergency call-out service
 - Permit assistance
 - Installation



With more than 2,000 vapor combustion and vapor recovery installations worldwide, John Zink is a recognized leader in vapor control.



Vapor Enrichment Train on a Dock Safety Unit

Superior Technology For Stringent Requirements

In 1990, due to the Clean Air Act Amendment, the EPA began to target volatile emissions from marine vessel loading and degassing operations for vapor control. Also in 1990, the United States Coast Guard (USCG) published regulations in 33 CFR 154 pertaining to vapor control systems for marine loading operations and guidelines in the Navigation and Vessel Inspection Circular

No. 1-96 to address safety requirements for marine vessel degassing operations. As a result, we began manufacturing complete Marine Vapor Emission Control Systems (MVCS) utilizing both vapor combustion and carbon adsorption-based ECDs that met those requirements.

Today, our vapor control technologies are recognized as the **“Best Demonstrated Technology”** and the **“Maximum Achievable Control Technology”** by the U.S. EPA. In addition, every John Zink MVCS is guaranteed to be certifiable by the USCG and to meet current emission limits set by the EPA.

Dock Safety Unit

In Marine Vapor Control Systems, safety begins at the dock. USCG regulations define the safety equipment that must be installed in a marine vapor emission control system and include requirements for vessel over/under pressure protection, fire and explosion protection,

and vapor conditioning. Our proven Dock Safety Unit (DSU) meets all these requirements, incorporating the dock safety equipment required by the USCG in a conveniently packaged skid-mounted assembly.



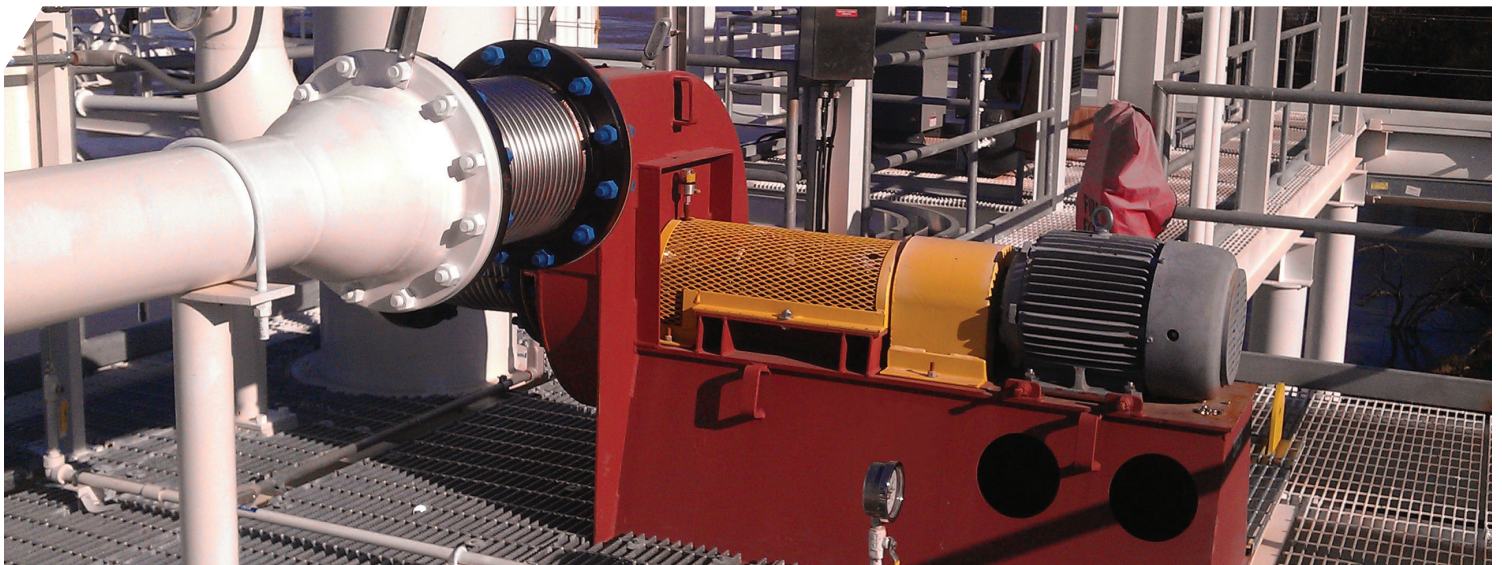
Dock Safety Unit

A John Zink DSU helps ensure safety at the marine vessel to protect operating personnel and the equipment.

Vapor Blower Unit

The Vapor Blower Unit (VBU) is designed to safely deliver the vapors from the dock to the Emission Control Device. John Zink VBUs include a spark-resistant blower to meet the Coast Guard requirements. Depending on

the application and ECD selected, other equipment supplied with this skid-mounted package could include a liquid knock-out drum, detonation arrestor, vapor cooler, piping, and controls.



Vapor Blower Unit

A John Zink VBU maintains smooth control over a wide range of loading rates and has excellent turndown capabilities.



Multi-Stack Marine Vapor Combustion System

EMISSION CONTROL DEVICES

Current federal emission regulations can be met with one of two Emission Control Devices: a Vapor Combustion System or a Vapor Recovery System. Our experts can evaluate the specific conditions at your terminal to determine the best technical and commercial solution, considering a variety of factors including equipment cost, value of recovered products, availability and cost of fuel gas, availability and cost of electricity, plot plan requirements, overhead clearances, weight restrictions, compatibility of products loaded, and secondary pollutants.

Vapor Combustion Systems

We offer several combustion technologies to cost-effectively handle a broad range of vapor compositions, flow rates, and destruction efficiencies. Our Vapor Combustion Units (VCUs), which vary from the simplest open flame flare unit to a more complicated temperature-controlled enclosed combustion systems, and low NO_x vapor combustion solutions, are designed to safely burn air/hydrocarbon and inert gas/hydrocarbon mixtures generated from marine operations. Advantages include:

- Low capital cost compared to alternatives with equal control efficiency.
- Operation simplicity.
- Low maintenance cost.
- Ability to simultaneously handle multiple chemicals.
- Fuel savings features for temperature controlled units.
- Multiple safety features including anti-flashback burners, detonation arrestor, and automatic shutdown valves.
- Enhanced turndown capability by incorporating the burner velocity control into the design.
- Destruction efficiencies typically exceeding 99%.

Vapor Recovery Systems

John Zink Vapor Recovery Systems are applied worldwide to the recovery of a wide range of hydrocarbon vapors in a variety of applications. The technology consists of a three-step process. Activated carbon adsorbs the hydrocarbon vapor component from the air-vapor feed stream allowing purified air to vent to the atmosphere. The carbon bed is regenerated by vacuum, which removes the previously adsorbed hydrocarbon vapor. This hydrocarbon vapor, removed from the carbon bed by the regeneration process, is then recovered as a liquid product by absorption into a suitable liquid absorbent or, in some applications, by direct condensation. Recovery efficiencies for these systems typically exceed 99%.

Our Vapor Recovery Systems often offer several advantages over alternative combustion-based vapor destruction technologies, including:

- Ability to be installed in a hazardous area which can reduce the cost of the vapor collection piping.
- Value of the recovered product offers a positive rate of return.
- No trade-off pollutants (oxides of nitrogen, carbon monoxide, carbon dioxide, etc.) are produced.
- Vapor conditioning (enriching, inerting, diluting) and associated equipment are not required.
- No supplemental fuel is needed to maintain minimum required combustion temperature during periods of low vapor flow and/or lean vapor concentrations.



Equipment Rental

To keep you up and running during installation, retrofitting or maintenance, we offer equipment rental including a portable dock safety unit and the PECS® (Portable Emission Control System), a self-contained, trailer-mounted vapor combustor that ensures stable, smokeless combustion and maintains temperature control over a wide range of vapor combustion.



PECS

Bundle a PECS rental with other John Zink services such as installation, start-up, on-site operator assistance and training, or dismantling to save both time and money.

WE BACK YOU UP LIKE NO OTHER

The John Zink worldwide service organization is the largest, most technically savvy team of its kind. Our service technicians are trained in the latest technologies to evaluate existing systems for upgrades and retrofits, to troubleshoot operations, and to help plan your next turnaround. Our experts are available on emergency call-out 24/7. We also provide comprehensive courses held at the John Zink InstituteSM. These courses help operators and engineers optimize their equipment and address issues at their facilities.

GLOBAL REACH

John Zink has locations all over the map, with thousands of employees worldwide.



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