

# CRUDE OIL VAPOR RECOVERY

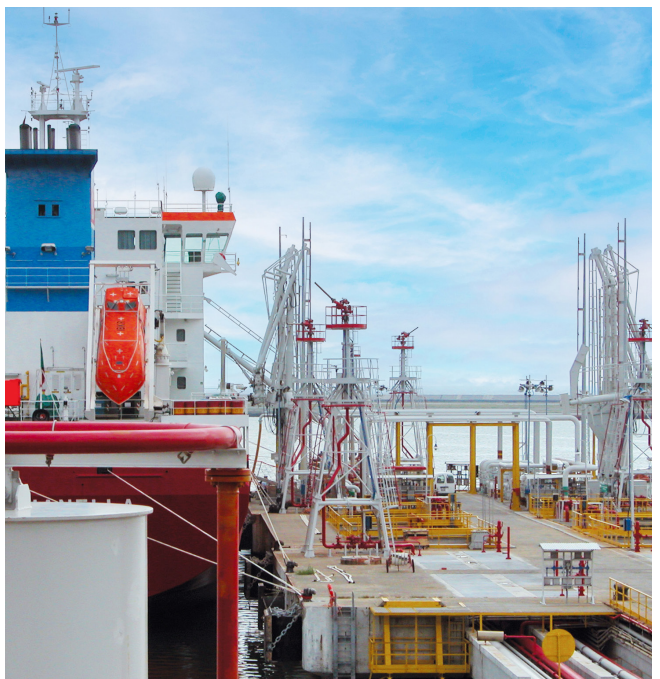
## GUARANTEED RELIABLE

Over 5 million cubic meters. More than 30 million barrels. Estimates say that's how much crude oil is lost each year through vapor generated from loading and storage operations. That's not just product, it's money and pollutants. But we've developed a system that can cost-effectively recover vapor from crude and other light semirefined products by reducing emissions, eliminating NOx and recapturing cash.

## Solving The Challenge With Expertise Like No Other

Crude oil loading operations present many technical challenges for a vapor recovery system. The product specifications can vary drastically from load to load, making it difficult to define the vapor composition accurately. High vapor pressures, high liquid viscosities, and H<sub>2</sub>S content create even more challenges. Not only can the content of the hydrocarbon vapor be extremely high, the hydrocarbon fraction contains molecules such as propane that are very difficult to capture with traditional pressure swing carbon adsorption technology. Overcoming these complexities to develop a reliable solution for crude oil vapor recovery has taken an industry leader like John Zink. It required knowledge and experience from thousands of vapor combustion and vapor recovery installations worldwide. It demanded years of dedication from leading engineering experts. And it involved world-class testing and development resources.

It is estimated **terminals can lose up to 3 barrels of product** per thousand barrels loaded.



Every time crude oil is transferred, product is lost. But we can help you minimize that loss. That's smart. That's John Zink.

## Recapture Product, Recover Profit

As NOx emission regulations become more stringent, terminals utilizing combustion for emission control are increasingly restricted to lower loading rates and reduced throughput. Crude oil vapor recovery, however, does not produce tradeoff pollutants. As a result, it can avoid these restrictions and increase terminal

productivity. Our crude oil vapor recovery technology provides financial benefits for the product owner as well, capturing lost product and the lost revenue associated with it. You'll get emission control efficiencies of 99% or better, plus a positive rate of return on investment due to the value of the recovered product.



CAA Test Stand

We developed Carbon Adsorption-Absorption (CAA) technology that meets the unique challenges of crude oil vapor recovery at our Tulsa, Oklahoma, research facility.

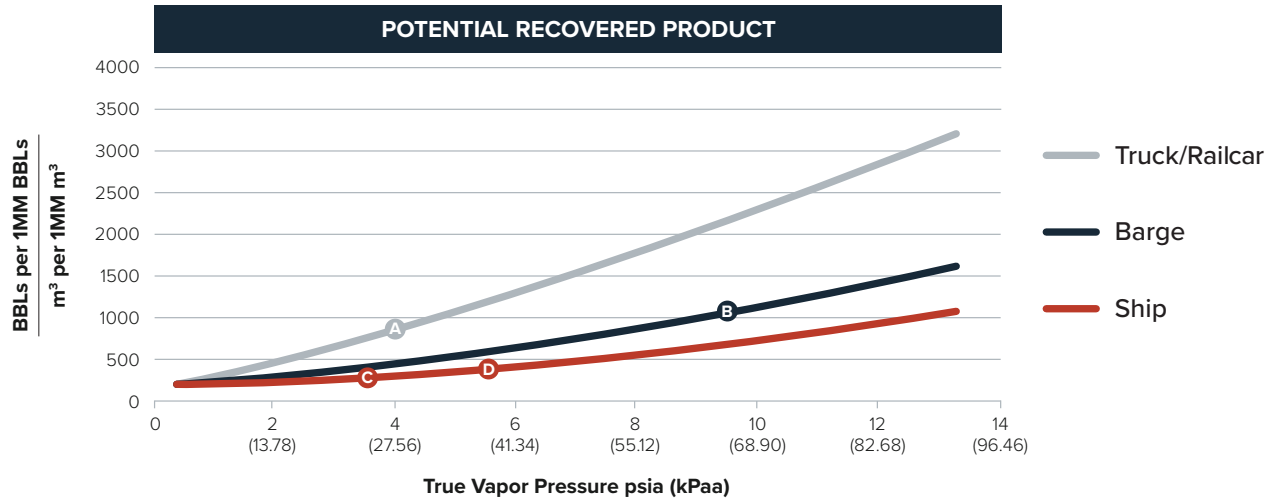
## Vapor Recovery Advantages

John Zink vapor recovery solutions have earned worldwide acceptance as the standard for evaporative hydrocarbon vapor control. Our solutions:

- Recover valuable product to provide a positive return on investment
- Produce no trade-off pollutants
- Can be installed in hazardous areas
- Require no flame to serve as an ignition source
- Require no vapor conditioning in marine loading
- Have no supplemental fuel requirements and minimal utility requirements (only electricity)
- Deliver proven reliability
- Are easy to operate and maintain
- Provide the highest emission control efficiency
- Are backed by worldwide service and support with emergency call-out available 24/7







**A**

**Bakken** crude with an API gravity of 42 is loaded into a railcar at a facility in Fargo, North Dakota. The average annual product temperature is assumed to be 50°F. The product RVP is 8.1 psia. Based on these assumptions, the average true vapor pressure of the product is 4.0 psia. A TVP of 4.0 psia will yield a **potential recovered product of approximately 750 barrels per one million barrels loaded.**

**B**

**Eagle Ford** crude with an API gravity of 58 is loaded into a shallow water barge in Corpus Christi, Texas. The average annual product temperature is assumed to be 75°F. The product RVP is 10 psia, resulting in an average product true vapor pressure of 9 psia. A TVP of 9 psia will yield a **potential recovered product of approximately 1200 barrels per one million barrels loaded.**

**C**

**North Sea** stabilized crude is loaded into a ship at a facility in England. The average annual product temperature is assumed to be 10°C. The product RVP is 51 kPaa. The average true vapor pressure of the product is 24 kPaa. A TVP of 24 kPaa will yield a **potential recovered product of approximately 250 cubic meters per one million cubic meters loaded.**

**D**

**Cristina Dilbit** crude with an API gravity of 22 is loaded into a ship at a facility in western Canada. The average annual product temperature is assumed to be 60°F. The average true vapor pressure of the product is 5.5 psia. A TVP of 5.5 psia will yield a **potential recovered product of approximately 400 barrels per one million barrels loaded.**



## EXCLUSIVE, WORLD-CLASS TESTING

The John Zink Research, Development and Test Center is the largest and most advanced testing complex in the industry. This exclusive resource allows us to push innovation, gain expertise and measure performance in a near full-scale setting under real-world conditions.



Research And Development Test Center

Customers come from around the globe to our International Research and Development Test Center.

## SERVICE AND SUPPORT

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 Institute<sup>SM</sup>. 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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