FAQ

Here are some of our most frequently asked questions:

How does an RTO work?

The premise of Cycle Therm's RTO design is as simple as 1-2-3:

1. Heat is extracted from the hot purified gas and stored in the reheat recovery chamber as it leaves the combustion chamber.
2. After a period of time, the inlet/outlet valves switch positions and the contaminated process gas is redirected through the hot heat sink recovery chamber where it is preheated to within 5% of the combustion temperature before it enters the combustion chamber.
3. In the combustion chamber, the burner supplements the 5%, bringing its temperature to 1500° F, at which the VOC is converted to harmless CO_2 and water vapor.

Visit Cycle Therm's website www.cycletherm.com to view an animated RTO in action.

What is the difference between a 2-chamber and multi-chamber RTO other than the obvious additional chambers?

The answer lies in destruction efficiency. Three chamber RTOs have slightly higher destruction efficiency than a 2-chamber RTO. This is because there is a generic slug of unburned VOC present in all RTOs which will be emitted to the atmosphere each time the chambers transfer. This slug or 'puff' as it is called, is residual VOC entrapped in the void areas which did not travel to the combustion chamber for oxidation and is subsequently expelled on the reversal of cycles.

In a 3-chamber RTO, the odd chamber can be taken off line momentarily without affecting flow, allowing its entrapped VOC slug to be removed for reprocessing. In a 2-chamber RTO, the 3rd chamber is not available for purging. Therefore, on transfer, the slug is emitted to the atmosphere.

That slug typically represents 1% of the total flow. So in reality, even if the remainder of the RTO functioned to destroy 100% of the VOC passing through it, 1% of the flow containing 1% of the VOC will be missed, resulting in a lower overall destruction efficiency.

The bottom line difference is that a 3-chamber RTO will be able to approach 100% VOC destruction efficiency while a 2-chamber RTO will only do about 99% destruction.

How long will it take my RTO to clog with particulate?

Unfortunately, there is no scientific way to know. Different types of particulate take different amounts of time to plug the RTO. Some particulates pass through the RTO; some lodge in the recovery beds and some, if organic, are oxidized.

All of Cycle Therm's RTOs are equipped with a bake out feature to carbonize organic particulate lodged in the system.

Will an RTO accept silicone fume without plugging?

Silicone in vapor form will convert to a solid above 1300 degree F and eventually will plug the RTO. How fast depends on how much is contained in the air stream and the void space within the type of heat recovery media used. Typically it adheres as a powder to the heat recovery media radiating above the 1300 degree F.

How come my RTO uses more fuel than promised in the original sales proposal?

The amount of fuel consumed depends on **true** thermal efficiency of the RTO and the amount of solvent in the process stream. That efficiency should be calculated as the unit's base line thermal efficiency with no solvent present in the air stream. This is the unit's true thermal efficiency with all correction factors figured in.

Your RTO was rated on its **nominal** thermal efficiency, which is the thermal efficiency of the regenerative heat exchanger as if it were a standalone device. But when you add a burner to the system, that efficiency becomes degraded by the amount of combustion air going into the burner. This is known as the RTO's mass/flow correction factor for thermal efficiency. Typically it degrades the device's nominal thermal efficiency by about 2%. Unfortunately, to overcome this 2% you must put enough solvent into the unit to eliminate the need for the burner.

The amount of fuel consumed per the proposal was based upon the unit always seeing a constant supply of solvent. As solvent levels decrease, the RTO will augment your solvent with additional natural gas thereby increasing fuel consumption.

For more information on this subject, visit our website and see the white paper Debunking Sales Rhetoric: How to Calculate RTO Operating Cost.

How come different RTO manufactures quote different horsepower on their main fan?

Horsepower is a great equalizer. Typically, the smaller the footprint of the RTO, the greater the HP required to overcome the resistance to flow.

While from manufacturer to manufacturer thermal efficiencies should remain constant, the horsepower and therefore the amount of electric power the system uses will vary dramatically- sometimes by as much as 250%!

The type of heat recovery media used and the velocity going through that media dictates the fan's horsepower requirement. The faster the velocity through a device, the smaller the device can be made. It boils down to fabrication economics. This comes at a price as the faster the flow moves through the unit, the more HP you need to push or pull it through the RTO. So in the long run, a smaller unit which is less expensive to purchase, may in the end force you to expend your initial saving with never ending additional operating costs.

To learn more about thermal efficiency and how to calculate operating cost for an RTO, see the White Paper Debunking Sales Rhetoric: How to Calculate RTO Operating Cost or click here to use our exclusive RTO fuel usage calculator.

Why is an electromechanical valve drive system better than pneumatic or hydraulic?

Unlike air or hydraulic systems, electromechanical valve drives are not impacted by ambient temperature extremes.

Pneumatic systems require oil and moisture control that must be maintained. Air lines from the compressor to the cylinder require heat tracing and insulation in cold climates. Pneumatic cylinders offer a fully engaged/fully disengaged operation. This causes slamming of the cylinder at both stops causing higher failure rates for parts. Essentially you are adding more components to the system, which decrease reliability and increase the frequency of replacing wear and tear parts.

Hydraulic systems use oil under high pressure. Oil viscosity changes as the temperature of the fluid changes. During these temperature changes the hydraulic cylinders operate slower or faster, which cause inconsistent valve operation. Inconsistent valve operation causes flow imbalances within the RTO, which can cause fluctuating fan operation and solvent removal efficiency. In addition, the hydraulic system's high pressure is a safety hazard to operating personnel and hydraulic oil leaks are a safety hazard to the environment. Essentially you are adding more components to the system such as pumps, heaters, hydraulic lines, which decrease reliability and increase the frequency of replacing wear and tear parts.

Cycle Therm uses only electromechanical valve drives which operate consistently in any weather. When the drive is connected to a variable frequency converter it allows precise start and stop control of the drive and valve assembly in both hot and cold climates. In a two

chamber RTO the valves share a common drive, allowing perfect synchronization, which creates a very stable operating condition. Electric drives are familiar, and do not require specialist for operation.

How do random packed heat recovery medias differ from structured?

Random packed media comes is different structural shapes and is literally placed in the heat recovery chamber randomly. The media can be installed or removed quickly in any geometric tower design. The random arrangement provides both void areas between the media pieces and also provides excellent heat storage characteristics.

Structured media is manufactured in specific dimensions and must be hand loaded into the heat recovery chamber. Precise fitting with the chamber is required to reduce short circuiting of the air flow. The media is usually thin walled and absorbs and desorbs heat quickly, which can require more frequent RTO valve cycle times increasing wear and tear on the valves. The more frequent valve cycling also increases peak emissions in a 2-chamber RTO.

For more detailed information on this topic, see our white paper Heat Recovery Media: Monolith/Structured vs. Random Packed.

About Cycle Therm

Cycle Therm is an international leader in the design, fabrication, and installation of Regenerative Thermal Oxidizers (RTO). The RTO we bring to market today is the genesis of over 30 years of design experience focused on a single product.

In addition, Cycle Therm provides turnkey installation services, repair and refurbishment and is a distributor of Cell Stone heat recovery media and tower packing.

For More Information

For more information on any of the above topics, please call 570-839-8836 or visit us on the web at www.cycletherm.com.

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