

Manufacturers are often faced with the conflicting objectives of meeting environmental compliance vs. reducing capital and operating costs. So it is refreshing when these two ‘adversaries’ (*reducing capital and operating costs*) team up to create a win-win scenario which precisely what occurred at an East Coast Coated Fabrics Manufacturer.

The material is coated with a solution which gives the fabric its unique characteristics. Alcohols and other VOC’s (volatile organic Compounds) are driven from the coating process and must be environmentally controlled before being released to the atmosphere in order for the manufacturer to remain environmentally compliant.

The coating process requires energy for heating the dryer air on a ‘once through basis’ with a gas fired burner, which dries the coating onto the fabric. While the dryer uses substantial energy, the real energy consumer was the Thermal Oxidizer (TOX) that was used to oxidize the VOC’s contained in the process exhaust prior to release to the atmosphere. To achieve the desired conversion efficiency ($\text{HC} + \text{heat} \rightarrow \text{CO}_2 + \text{H}_2\text{O}$) the TOX heated the dryer air from ~180°F to 1500°F. The TOX used 3,800,000 BTU/Hour to achieve the 98% conversion efficiency.

Due to the demand for products on the increase, the manufacturer was looking into expanding capacity. The current dryer could not keep up with the new demand, so they knew that new production equipment would also mean additional environmental equipment and the associated higher energy cost.

They decided to contact an environmental consultant, Bob Frank, President of Compliance Monitoring Services. They were looking for an environmental consultant who was familiar with both the EPA requirements as well as the Air Pollution Control Equipment (APC). They also wanted someone with knowledge of the environmental requirements for coated fabrics, but just as important the ability to understand their process and recommend control equipment that wasn’t so expensive to buy and operate that it would kill the expansion project before it got off the ground.”

Bob Frank, President of Compliance Monitoring Services states: *“They are a medium size manufacturer feeling some growing pains. They were eager for a fresh perspective, they were just too busy to stand back and look at the big picture so when I made suggestions they were receptive. There were a few ways to approach the emission control issue, Thermal Oxidizer like the one used on the existing dryer was a straight forward low capital cost approach. The downside was the high energy cost. I called a couple of suppliers of APC equipment and asked them to make a recommendation based on the manufacturer’s process conditions. As expected the response from the APC companies were varied with the providers promoting either the RTO (Regenerative Thermal Oxidizer) which has a high capital cost but a low energy cost or a high energy consumer Thermal Oxidizer. The manufacturer’s plant supervisor was intrigued by one of the proposals. One company provided us with a matrix of several of the options, comparing the features-Pros and Cons- of the competing technologies. We liked this approach so we invited Air-Clear, LLC to meet with us to discuss the options in detail.”*

CATOX™ Controls Emissions from 3 Coater Dryers as well as Returns Heat Back to the Dryers

Comparison of various Oxidizer data for TransWeb, LLC

Equipment type	Capacity SCFM	Destruction Removal Efficiency (%)*	Thermal Energy Recovery Efficiency (%)	Dimensions L x W x H	Delivery in Weeks after order	Fuel use with no IPA loads (btu/hr)	Horse Power BHP	Estimated annual Operating costs**	"BUDGET" Cost of Equipment***	Five year 'cost to own' Cost ***
C A T A L Y T I C	3,000	98	0		10	1,544,400	7.5	\$83,690	\$129,000	547,451
	3,000	98	60	17 x 6 x 10	13	589,680	20	\$39,868	\$175,000	374,339
	4,500	98	0		10	2,316,600	10	\$125,065	\$168,700	794,027
	4,500	98	60	20 x 8 x 11	13	884,520	25	\$57,922	\$215,000	504,609
	6,000	98	0		10	3,088,800	15	\$167,381	\$210,000	1,046,903
	6,000	98	60	23 x 9 x 13	13	1,179,360	30	\$75,976	\$238,000	617,879
T H E R M O G E N	3,000	98**	95	20 x 9 x 15	18	250,965	20	\$20,661	\$300,000	403,306
	4,500	98	95	25 x 10 x 15	18	376,488	25	\$29,112	\$335,000	480,559
	6,000	98	95	30 x 12 x 15	18	501,930	30	\$37,562	\$385,000	572,812
T H E R M O C A T	3,000	98-99	0	3'Ø x 20'H	10	5,475,600	7.5	\$265,649	\$85,000	1,413,243
	4,500	98-99	0	4'Ø x 20'H	10	8,213,400	10	\$398,003	\$104,000	2,094,015
	6,000	98-99	0	5'Ø x 20'H	10	1,051,200	15	\$531,297	\$130,000	2,786,487

NOTES :

*The catalytic unit can be made to achieve a 99% DRE by increasing the catalyst volume. Thermal units by increasing the temperature. The

** Estimated operating cost do not account for the IPA, so they will be less than stated. The cost are based on \$8/ MMBTU fuel and 8.07\$/kwh

***The cost to own is five years of operating cost plus the capital cost. This number is

**** The loadind(Lbs./Hr.) of IPA may effect the capital cost if the loadings require a high

Laying out the options helped focus on proper equipment for the specific conditions



After a year of operation, a stack test demonstrated the CATOX was performing well above the designed conversion rate of 98%

Richard “Rich” Stone VP of Engineering at Air-Clear states: *“The first thing that hit me when I looked at the process with the plant supervisor was the space constraints for both the new production equipment and the limited space for the APC equipment. The second thing was their repeated references to their escalating natural gas costs. The owner of the company pulled out the utility bills and I could see what the concern was about.”*

Air-Clear took a close look at the dryer design and after a week they returned with somewhat surprising proposal.

Bob Frank, President of Compliance Monitoring Services states: *“Right from the start the RTO option looked like the best long term solutions because of its low energy cost so I was surprised to see Air-Clear’s offer of a Catalytic Oxidizer or CATOX™ as they call it.”*

The CATOX™ proposal however had a twist to it. The offering not only included the heat exchanger that would be used to preheat the process air with the hot (650 - 700°F)

post oxidizer air but the proposal included a second heat exchanger that would be used to heat outside air which would then be returned to the dryer-greatly reducing the gas consumption in the dryer itself. In fact, the combination of the pre-heater, secondary exchanger and the exotherm from oxidized VOC's would result in a system that would be nearly energy independent during production.

The owner of the company stated: "I felt it sounded too good to be true, but we had to pursue this option further because it was less capital cost and lower energy cost vs. the RTO Option."

Richard "Rich" Stone VP of Engineering at Air-Clear states: *"Frankly, the end result surprised me as well. However when you keep your mind open and let the numbers speak, that's the way it worked out."*

The CATOX has been operational for over two years. Since the CATOX was installed two additional production lines have been installed all feeding to the CATOX.

The Owner sums up the project by saying....*"We have increased production threefold, decreased gas use by enough to repay the CATOX investment and we have reduced overall emissions, testing above 98% removal efficiency. This project is something everyone is proud of, there are a lot of companies striving to get "Greener" but we have reduced emissions, cut fuel cost and all While increasing productivity....That's my definition of "Greener!!"*



CATOX™ controls emissions from 3 coater dryers as well as provides heat back to the dryers