APC TECHNOLOGIES, INC.

Air Emission Control Systems & Service

Case Study

STICKY PARTICULATE CONTROL FROM ADHESIVES PRODUCTION

Background

A large global company in the chemicals and petrochemicals industries has, among other plants worldwide, a plant in the U.S. that produces high-performance adhesives and sealants. The products are used to bond and seal parts in automotive, aerospace, general assembly, packaging, textile, and other applications. The adhesives are produced by processing a variety of materials in large kettles, forming the products under controlled conditions.

The plant had issues with emissions of very fine particulate, aerosol, and volatile organic compounds (VOCs) in the reactor kettle and cooling line exhaust. The particulate and aerosol size in the emissions is in the sub-micron range, and due to the nature of the product, these particulates are extremely sticky.

The emissions posed two problems. First, the emissions were depositing on buildings and other assets around the plant, including employees' and visitor automobiles, and the sticky deposits were extremely difficult to remove. Second, there were substantial visible emissions from the stack, in potential violation of local opacity limits. The plant's objective was straightforward: to identify a proven, reliable, and economical solution that would eliminate the fine aerosol, condensed VOC, and particulate emissions.

Comparison of Alternatives

After emission prevention projects were completed, the plant's alternatives included the following emission control technologies:

- Venturi scrubber
- Catalytic oxidizer with high-efficiency pre-filter
- Ultra High-Efficiency Filter (UHF®) unit

A summary comparison of the options is provided in the table below. The venturi scrubber was not selected due to low control efficiency on submicron particulate (unless extremely high pressure is used, with corresponding much higher energy costs, i.e., factor of 3-4 or more), plus the wastewater disposal issue (not included in cost above).

Summary of Emission Control System Options, 40,000 ACFM Adhesives Production Exhaust

	Venturi Scrubber	Catalytic Oxidizer	UHF Filter
Fan Motor BHP	225	225	150
Electr. Energy Cost1	$71K/yr	$71K/yr	$47K/yr
Nat. Gas Cost	-	$342K/yr	-
Mat'ls & Other Cost	water trtmt/dspsl	$25K/yr	$8K/yr
Total Operating Cost	$71/yr +	$438K/yr	$55K/yr
Capital Equipment Cost	$125K	$300K	$125K
Control Efficiency	~70%	97%+	98-99%
Uptime	80-90%	90-95%	95-99%

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The catalytic oxidizer (with high-efficiency pre-filter) was known to be able to do the job well, but the cost of burning such a large volume of air was far too high, even at the lower combustion temperatures facilitated by the catalyst.

The Ultra High-Efficiency Filter (UHF®) system was an unknown technology for the plant. However, the projected performance and economics appeared very attractive, and the plant was 24/7, and the simple design and operation of the UHF® unit was appealing, including that filter replacement was performed while the unit and process is running. Regarding overall economics, the UHF® system offered by far the lowest capital and operating cost.

Decision and Result

A Model 511 UHF® filter unit for 40,000 ACFM was installed in 2000. The unit eliminated the adhesive particulate (both liquid and solid) that had been depositing on the buildings and automobiles, and there is no longer any visible emission (opacity) from the stack. The system runs 24/7 with no unscheduled downtime. The company has been very pleased with the performance of the unit, and the project was considered for a state clean air excellence award.

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