case STUDY

FOOD & BEVERAGE

Air Filtration - Total Cost of Ownership

Midwestern Beef Producer Maintains Product Safety While Realizing Substantial Savings in Energy, Product and Labor

Company Profile:

One of America's largest beef processing plants, located in an area of the Midwest that is part agricultural, part industrial, with a challenging climate.

The Situation:

Processing facility had five large 100,000 CFM air handling units (AHUs) with three stage filtration. The first two stages, prior to the coil, included MERV 8 low-cost generic ring panels followed by Quality Filters' MERV 11 pleats. The two-filter combination gained resistance quickly in this environment. Combined differential pressure of the two filters commonly increased from .7" w.g. to 1.3" w.g. within 30 days of installation. The pressure increase lowered the air volume delivered to the plant, resulting in frequent filter change-outs to boost airflow. The high differential pressure caused energy costs to be unnecessarily high from the fan working harder to overcome the growing resistance.

Downstream of the coil in stage three, the Tri-Dim Predator V Cell MERV 14 final filters were structurally weak and partially collapsed before the end of the projected service life. The poor filter quality allowed for contaminants to pass through to the food processing areas.

Frequent filter change-outs were a major cost and scheduling burden for the facility, and airflow and air quality were both in jeopardy.

The Action:

Camfil was invited to perform a Life Cycle Cost (LCC) analysis which models the performance of filter products under specific "real world" operating conditions. LCC identified that airflow and air quality would improve substantially by replacing stages one and two with a single-stage, Hi-Flo ES MERV 11 bag filter. The analysis also estmated the Hi-Flo ES would maintain an average pressure drop of .3" w.g. for several months.

In the final stage, the LCC calculated the Durafil ES MERV 14 with scrim support would reduce overall system differential pressure by an additional .1" w.g. while significantly increasing the percentage of dangerous submicron particles collected. The Durafil's stronger frame with the scrim support downstream of the media would also maintain MERV 14 efficiency and structural integrity for a year or longer.

The Result:

The Camfil recommeded filters were installed in three of the five AHUs. In the three systems, the filter performance in all three stages tracked as predicted by the LCC modeling software. The conversion delivered significant savings, reducing energy costs by 63%, labor costs by 74%, and disposal costs by 86%. The Camfil filtration solution proved an annual cost savings potential of $14,622 per AHU.

"Hi-Flo ES eliminated one filter stage reducing enery, labor and waste dramatically."

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The Proof:

Energy - The LCC analysis showed an average pressure drop of 1.58" w.g. over the life of the filters in the original two-filter design. The average pressure drop over the life of the single MERV 11 Hi-Flo ES bag was .45" – an average pressure drop difference of 1.13" w.g.

In the final stage, the average differential pressure drop of the Durafil was .11" w.g lower than the Tri-Dim Predator – an annual energy sav-ings of $1,061 per unit, $5,305 total. Camfil also documented that in laboratory testing, the MERV 14 Tri-Dim Predator product consistently tests as a MERV 13. Since efficiency and resistance are closely related, the Camfil Durafil ES is delivered a full point higher MERV rating at .11" less differential pressure.

Product - In the original stage one and stage two configuration, the ring panel filter was replaced on average 12 times per year and the second stage filter once per year. The single-stage Hi-Flo ES would remain in service between six months to one year, providing a po-tential savings of $1,010 per unit by sourcing a single filter per year versus up to 13 filters per year.

The stage three final filters should have a minimum service life of one year, and the Camfil Durafil ES and Tri-Dim Predator were both expected to achieve the benchmark. The collapsed Tri-Dim filter jeopardized the service life expectation. The Durafil ES with the stronger frame construction and scrim support provided the filter rigidity to maintain performance standards for a minimum service life of one year. Built to meet or exceed all filtration specifications and operate at a lower differential pressure drop, the higher priced Durafil ES generated savings in the end.

Labor - The ring panels in stage one required up to 12 change-outs annually at an estimated labor cost of $200 per change-out, totaling $2400 per year. The filters in the stage two were changed annually at an estimated cost of $400. The Hi-Flo ES annual labor cost was calculated at $300 due to the elimination of one filter stage and due to the innovative packaging design that enabled up to eight filters to be conveniently handled simultaneously by one individual. The single-stage Hi-Flo ES conversion would result in a probable an-nualized labor savings of $2,500 per unit or $12,500 in total.

Tri-Dim
Damaged Filter

Hi-Flo ES
Collected Contaminant

Total Cost of Ownership Comparison

Filter Style & Description	Size	Filter Count	Filter Life (hrs)	Filter Changes per year	Average Pressure (in w.g.)	Annual Product Cost	Energy Cost	Labor Cost for filter changeouts	Disposal Cost @$2.00	Annual Cost per Unit
TD-Tri-Dek 15/40 3-Ply Panel M9 1"	24x24x1	40	730	12.0	0.49	$1,440.0	$4,700.0	$2,400.0	$1,200.0	$9,920.0
	12x24x1	10				$180.0				
Quality Filters Merv 11 4" pleat	24x24x4	40	8,760	1.0	1.09	$2,000.0	$10,524.0	$400.0	$100.0	$13,274.0
	12x24x4	10				$250.0				
TD-Predator 4V M14 12"	24x24x12	40	8,760	1.0	0.41	$3,600.0	$3,851.0	$600.0	$100.0	$8,601.0
	12x24x12	10				$450.0				
					1.99	**$7,920.0**	**$19,075.0**	**$3,400.0**	**$1,400.0**	**$31,795.0**
Merv 11 HiFlo ES bag (6 month changeout cycle)	24x24x22/10	40	4,380	2.0	0.32	$5,040.0	$3,056.0	$600.0	$200.0	$9,576.0
	12x24x22/5	10				$680.0				
Durafil® 4V M11 12"	24x24x12	40	8,760	1.0	0.30	$5,200.0	$2,790.0	$600.0	$100.0	$9,550.0
	12x24x12	10				$860.0				
					0.62	**$11,780.0**	**$5,846.0**	**$1,200.0**	**$300.0**	**$19,126.0**
Merv 11 HiFlo ES bag (12 month changeout cycle)	24x24x22/10	40	8,760	1.0	0.45	$2,520.0	$4,363.0	$300.0	$100.0	$7,623.0
	12x24x22/5	10				$340.0				
Durafil® 4V M11 12"	24x24x12	40	8,760	1.0	0.30	$5,200.0	$2,790.0	$600.0	$100.0	$9,550.0
	12x24x12	10				$860.0				
					0.75	**8,920.0**	$7,153.0	**$900.0**	**$200.0**	**$17,173.0**