ACTION PLAN LESSON FIVE - SOLUTION
COST SAVINGS ACTIVITIES

1. You're leading a team of Reliability and Maintenance staff for a large rubber manufacturing company. The plant has 25 presses with four hydraulic cylinders per press. Failure rates on the hydraulic cylinders are terrible and getting worse (e.g., rebuilding 2 per month at a cost of $20,000 each, *plus* 48 hours of downtime)! Your oil spend is over $15,000 per month. To save money three years ago, the purchasing team began sourcing hydraulic oil from a recycler. There is no existing oil analysis program at this facility.

   A. What is the mean time between failures (MTBF) for the hydraulic cylinders?

   - 25 presses with 4 hydraulic cylinders per press = 100 hydraulic cylinders
   - rebuilding 2 hydraulic cylinders per month at $20,000 each
   - 48 hours of downtime per month

   MBTF = 100 cylinders/2 failures = **50 months**

   B. What actions can be taken to reduce the number of failures?

   - Investigate failure modes to determine PdM tasks, including operational parameters
   - Estimate the cost/benefit and implement a program
   - Trend the MTBF
   - Evaluate vendor
   - Use lube analysis to compare product quality OEM specifications against operating hydraulic fluids

   C. What actions can be taken to monitor the condition of the hydraulic cylinders?

   - Implement visual inspections at prescribed intervals
   - Perform lube analysis on all cylinders
   - Validate failure modes with every failure

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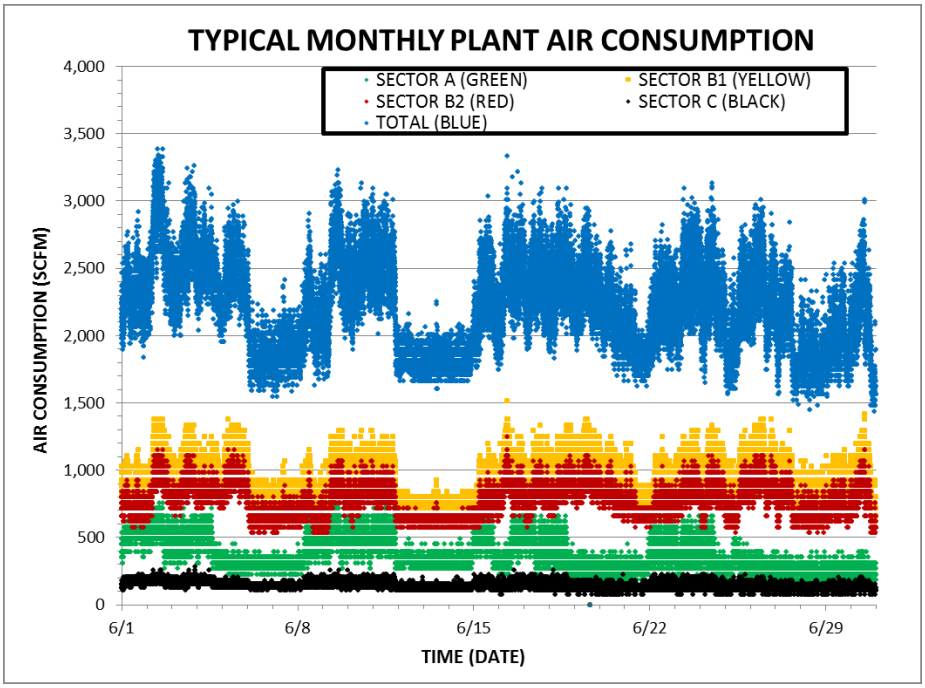
2. This chart shows in blue the monthly air consumption for a plant. The plant conducts an air audit. The audit shows a number of leaks are found and air knives are determined to be operational when the plant is shut down. The leaks total 345 SCFM. The air knives are determined to be using 1,036 SCFM continuously when the plant is operational. The plant operates three days per week. Each of the three compressors is capable of producing 1,413 CMF at 100 psig.



A. Complete the table below to calculate the estimated annual savings:

Item	Usage (SCFM)	Power-Output Ratio (kW/SCFM)	Electricity Cost ($/kW-hr)	Hours Saved (hr/yr)	Estimated Annual Cost/Savings ($)
Leaks	345	0.16	$0.08	(24x365)	$38,684
Air Knives	1036	0.16	$0.08	[24x365x(4/7)]	$65,380
				Total:	**$105,064**

B. If the total usage could be brought below 2,800 SCFM, what other benefits are gained?

For usage below 2,800 SCFM: one compressor would not be needed all the time and could be taken off line (at least 18-23 days per month based on current operating time above 2,800 SCFM after the elimination of the 345 SCFM air leaks. This would allow for a different maintenance strategy (current run-to-fail or time-based or condition-based) to make repairs on a planned/scheduled basis (which would be 6-10 times less expensive and often without production impact.

Depending on available piping, Sector C (black in the chart) may need to be combined with Sector B1 (yellow), and Sectors A (green) and B2 (red) may need to be combined so as not to exceed the output of an individual compressor.