

SIDEPAK™ AM520/AM520i PERSONAL AEROSOL MONITOR RETURN ON INVESTMENT

APPLICATION NOTE EXPMN-015 (A4)

Can the investment in the new SidePak AM520/AM520i be justified by the Return on Investment?

Justifying the costs to purchase new aerosol monitoring equipment is a necessary requirement in the purchase decision. Showing the value of process simplification, increased efficiencies, shorter response times and quicker decision making can be challenging.

The analytical lab cost per gravimetric sample is easy to calculate. But what is the total cost associated with conducting the whole exposure assessment for a group of workers or a process activity? One breathing zone sample collected on one operator seldom has statistical significance representative of the work group. Multiple samples over time are necessary to capture variation in the process and obtain representative data. To do this certain factors must be considered:

- How many samples are needed?
- How much equipment is needed to collect these samples?
- How much time is needed to implement the sampling strategy?
- How is cost impacted when using consultants vs. our own technicians?

These are all good questions that need to be factored into the sampling strategy and analysis when calculating a return on the investment of any new monitoring equipment.

To help you with this analysis, we have created a comparison of the costs of employing gravimetric sampling using **5 standard sample pumps vs. using a single TSI AM520 Real-Time monitor to collect 100 air samples.** You may want to create a similar analysis for the AM520i product. What follows is a cost/savings comparison in three different views of the costs associated with executing this strategy:

- [Equipment and lab costs to process samples and get test results.](#)
- [Cost of technician “administrative” time required for collecting a full-shift aerosol sample.](#)
- [Opportunity cost to identify exposure issues and implement changes.](#)



How much does it cost to conduct exposure monitoring? What's my ROI?

A) Cost of Equipment and Supplies

If the site Industrial Hygienist buys five standard* sampling pumps to conduct a sampling strategy of 100 air samples, total cost of equipment, supplies, and analytical can be \$13,500 compared to using a SidePak AM520 Personal Aerosol Monitor with a total cost of \$6,550.

Equipment & Analytical Costs (100 samples)			
Gravimetric Pump Sampling		AM520 Personal Aerosol Monitor	
Pump purchase 5 pack pump kit	\$ 4000	AM520 Instrument purchase	\$5300
Calibrator (TSI 4146 Flowmeter)	\$ 1250	Calibrator (TSI Model 4146 Flowmeter)	\$1250
Sampling media \$78 for case of 50 (x2)	\$ 156	N/A	
Tubing and misc. connectors, holders, etc.	\$ 100	N/A	
Respirable Cyclones \$95 x 5	\$ 475	N/A	
Lab analytical of \$75/sample x 100 samples	\$ 7500	N/A	
Sample shipping \$10 each x 10 sampling batches	\$ 100	N/A	
Total:	\$13,582	Total:	\$6,550
Total Saving for AM520 (including equipment, supplies & analytical): \$7,032.00			

* Catalog list price of leading pump manufacturer pump 5-pack.



B) Technician “Administrative” Time Required for Collecting a Full-Shift Aerosol Sample

Collecting industrial hygiene air samples is not difficult, but it is detail-oriented. Some would call it tedious. Calibrating pumps to the proper flow rate to ensure accurate measurement of sampled air volume is critical. Documentation of pump calibration must be maintained along with the chain of custody tracking forms for the sample media to make sure the data obtained is legitimate. Factoring in the time to ensure the proper methods are being used and gathering equipment and media, this administrative preparation time can add up.

Using a direct reading instrument eliminates some of the administrative preparation time. The chart below compares the time required to collect an air sample with a sample pump versus a light scattering photometric instrument like the SidePak AM520/AM520i. (*Note: The length of time for the sample was not included in this estimation.*)

Traditional Gravimetric Sampling		Direct Reading Aerosol Instrument	
Research analytical method	(1 min)	N/A	
Collect sampling media	(1 min)	N/A	
Assemble sampling train	(1 min)	N/A	
Calibrate pump with sampling train	(5 min)	N/A	
Document pump calibration on log	(1 min)	N/A	
Label sampling cassettes for area sampled	(1 min)	N/A	
Place sampling pump on worker and start pump. Note time started on sampling log.	(5 min)	Place AM520/AM520i on worker at sampling location. Program sample run time.	(5 min)
Check periodically	(5 min)	Check periodically	(5 min)
Turn off pump and record stop time on log	(1 min)	Turn off AM520/AM520i and log activity notes	(1 min)
Post calibrate pump	(5 min)	N/A	
Record post calibration results on log	(1 min)	N/A	
Complete chain of custody form	(1 min)	N/A	
Label and package for shipping	(1 min)	N/A	
Ship samples to lab and wait 5 to 10 days for results		Download results	(1 min)
Document results and email basic report to Manager	(5 min)	Document results and email to Manager	(5 min)
Total administrative time: 34 minutes/sample Plus 5 to 10 day wait for analytical results		Total administrative time: 17 minutes/sample Results are known immediately	
Time Savings For Actionable Test Data: 50% or 17 min/Sample			
Days Saved to Take Corrective Action: 5 to 10 Business Days			

Most sampling efforts involve multiple samples over multiple days. Suppose the above steps are repeated daily to monitor at this location for five days in a row to evaluate variability of dust exposure for this activity.

Cost for 5 days of sampling

Total Administrative Time Commitment	
Traditional Gravimetric Sampling	Direct Reading Aerosol Instrument
170 minutes (34 min/sample × 5 days) <ul style="list-style-type: none"> Still waiting for lab results = Opportunity cost. 	85 minutes (17 min/sample × 5 days) <ul style="list-style-type: none"> Results are known IMMEDIATELY. Plans are being made to reduce any identified exposures of concern.

A Certified Industrial Hygienist (CIH) consultant can bill between \$150 and \$300 per hour depending on where the work is being performed. The administrative time to prepare pumps and document sampling is in addition to travel time and the time on site collecting the samples. When the number of samples increases, this administrative time will increase as well.

If a company has an Industrial Hygienist and/or technician on staff, exposure monitoring may be conducted in house. This administrative time often is not measured or recognized because it is considered part of the job. Environmental, Health and Safety (EHS) staff personnel are very busy people, often wearing “multiple hats.” The opportunity cost of other tasks and activities that in-house EHS personnel are pulled away from to conduct air sampling is often the driver for bringing in a consultant. Using the same thought process discussed above, administrative time has been calculated for a salary of \$100,000 per year for a staff CIH at \$50/hr. and \$25/hr. for a \$50,000 per year technician-level employee.

	Cost of sample pump Administrative” time: 170 min ≅ 2.75 hr.	Cost of AM520/AM520i “Administrative” time: 85 min ≅ 1.5 hr.	Cost Savings (for five samples)
Consultant	2.75 hr. @ \$300/hr. = \$825	1.5 hr. @ \$300/hr. = \$450	\$ 385
Consultant	2.75 hr. @ \$150/hr. = \$412	1.5 hr. @ \$150/hr. = \$225	\$ 187
Staff CIH	2.75 hr. @ \$ 50/hr. = \$137	1.5 hr. @ \$50/hr. = \$ 75	\$ 62
Technician	2.75 hr. @ \$ 25/hr. = \$ 69	1.5 hr. @ \$25/hr. = \$ 37	\$ 32

As the amount of time and number of samples increases; obviously, the administrative time and the respective cost increases as well. Keep this in mind when considering expenditures for sampling equipment. A more expensive direct-reading instrument can be less expensive to use based on long-term administrative costs.

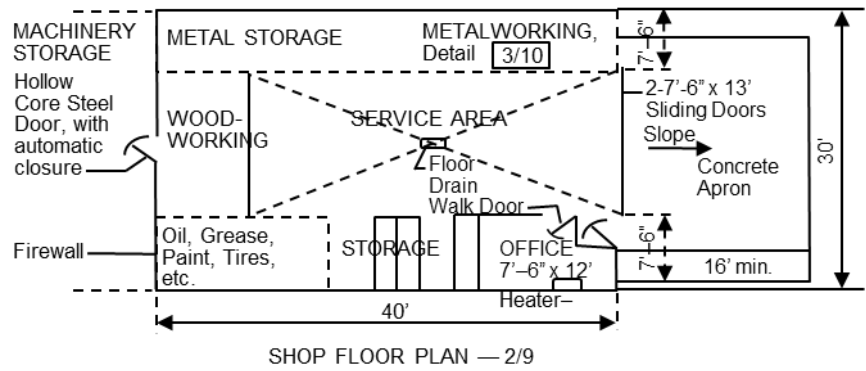
Total “Administrative Time” Cost Savings (5 days of data): Up to \$385 saved.

C) Opportunity Cost—Identification of Exposure Issues

This section again compares a scenario using five (5) sampling pumps versus using a single (1) SidePak AM520/AM520i to investigate engineering controls that are in place to manage aerosol levels.

Often times an industrial hygienist may be involved to measure exposure levels due to complaints or changes in process. The operation can be well below Permissible Exposure Limits for exposures mandated by OSHA. However, when employees or managers have questions or concerns, air samples can help answer questions. The quicker the information can be obtained, the sooner the questions can be answered and any problems corrected. Waiting five to ten days for sample results to return from a lab can seem like a long time if an employee continues to have complaints or respirators have been mandated until the air sampling results are returned. Having a real-time, direct-reading aerosol instrument can be very helpful for these situations.

This example compares the length of time to measure employee exposure for ten individuals and get enough information to identify problems and implement solutions. *(Note: This example is not based on exposure monitoring for OSHA compliance to a Permissible Exposure Limit. Comparison to a gravimetric reference sample is required for OSHA PEL compliance.)*



	Traditional Gravimetric Sampling using five air sample pumps	Real Time monitoring with a single AM520/AM520i
Day 1	4-hour air samples as follows: Task 1 to 5 (AM), task 6 to 10 (PM). Send samples to lab for 5-day turnaround.	Collect 45 minute samples from workers performing tasks 1 to 10. Download data.
Day 2	Waiting for results.	Review results and Recommend Changes. ○ Are workers put in respirators while waiting for engineering controls to be implemented?
Day 3	Waiting for results.	Implement changes to engineering controls and procedures.
Day 4	Waiting for results.	Resample to validate corrections: Collect 45 minute samples from workers for tasks: 1 to 10
Day 5	Waiting for results.	Download data and review results.
Day 6	Waiting for results.	Move on to the next process area.
Day 7	Receive lab results.	
Day 8	Recommend Changes ○ Have people been working without adequate respiratory protection for the past five days?	
Day 9	Resample to validate corrections: Collect 4-hour samples from workers for tasks 1 to 10.	
Day 10	Send samples to lab for 5-day turnaround.	
Days Saved (Collecting Samples, Getting Results, Taking Corrective Action, Validation of Actions): 5-10 DAYS!		

This example illustrates how real-time instruments can provide information immediately.

This information can be used to improve the working conditions and protect employee health. If an unacceptable exposure is identified, employees must be protected. This may involve shutting down the process or putting workers in respiratory protection. Shutting down obviously is a huge hit to the bottom line of any business. If a process is stopped or shut down for five days while waiting for lab results, the cost of this down time will easily justify the purchase of real-time instruments.

To avoid shutting down, a company may choose to continue to operate, but put employees in respiratory protection until the fix is made. Putting people in respirators involves much more than just buying the equipment from a vendor. Employees must be trained, medically qualified, and fit tested (with a TSI PortaCount® Respirator Fit Tester) before a respirator is used. These steps take time and cost money. Identifying a problem and fixing it today is the best choice for all involved. Only real-time, direct reading instruments like the SidePak AM520/AM520i can provide immediate information about aerosol exposure.

Ways Return on Investment can be demonstrated

The above analysis shows that the TSI—AM520/AM520i Real-Time, Personal Aerosol Monitor reduces the costs of collecting samples, getting results and taking corrective action. The advantages of using the AM520 are:

- No costs for consumables like sampling media and analytical support when using AM520/AM520i aerosol monitor.
- *Reduced administrative time* required to collect a valid sample data from 34 minutes to 17 minutes per sample.
- *Virtually eliminating the time* spent waiting to receive analytical results, enabling the organization to identify issues almost immediately and verify implemented corrective actions just as quickly. The Industrial Hygienist can move on to the next area, possibly completing evaluation of the third process area before analytical results verifying the implemented corrections from the first sampling is received.

The Return on Investment (ROI) of using AM520/AM520i will depend on several variables unique to your situation. To help you do your own analysis, we have created a separate AM520/AM520i **ROI Calculator** (TSI Document #: EXPMN-018) where you can enter your own information and calculate the savings and pay-back time you are likely to experience when you incorporate the many advantages of real-time monitoring using the **NEW TSI – SidePak AM520/AM520i Personal Aerosol Monitor**.



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