Environmental Monitoring Programs (EMPs) Deliver Business ROI

But only if you can measure EMP impact on automation of operations, waste reduction, and program efficiency.

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About This Research White Paper

This document describes how organizations are using workflow automation and analytics to uncover new opportunities for delivering quantifiable business return on investment (ROI) from their EMPs. The content in this white paper covers the following topics:

- **The methods for discovering this largely untapped ROI.**

  The findings are based on the experiences of customers using advanced technology to gain greater visibility into the impacts that pathogen and indicator organism testing can have on operational performance inside food production facilities.

- **The formulas and metrics for measuring EMP-driven business ROI.**

  These calculations are based on the experiences shared by over 120 facilities that are using advanced EMP workflow automation and analytics today. Through this set of experiences, food suppliers have discovered various means of achieving new business impact and measurable ROI.

- **Primary research via direct interviews.**

  During the course of 2018–2020, the author interviewed food safety, operations, and executive leadership at dozens of food supplier organizations who are investing in and using advanced EMP technology. The findings shared in this document are a distillation of these interviews, highlighting where significant overlap of experience in defining and realizing ROI has been discovered.

Busting a Preconceived Notion About Food Safety

In researching this topic, we approached several organizations that have automated their environmental monitoring programs (EMPs) — the series of testing, diagnostics, corrective actions, and analytics directed at detecting, analyzing, and eradicating pathogenic, bacterial, and other contamination issues from their production environments.

Many organizations and professionals that were approached as part of this research shared a similar "busting" of a preconceived notion — that the *food safety function was primarily a "necessary cost center."* This notion is founded in the execution of Food Safety Modernization Act (FSMA) legislation, which mandates that food suppliers define, operate, and produce verification of a functioning food safety plan that adheres to the strict guidelines within the legislation. EMPs are central to the sanitation controls as described in the legislation and serve to verify that cleaning and sanitation are effective and result in food production environments that produce food safely, free of pathogens, bacteria, and other contaminants that could harm consumers.

A mandate, by its very nature, elicits a compliance response. Understandably, this shifts the emphasis and focus to one of reaction — to a "least possible cost" approach to ensuring the organization is compliant (and therefore not vulnerable) to being found in violation of regulatory mandates. This emphasis can supersede any thought of how an organization can derive business benefits from such mandated functions, aside from avoiding non-compliance penalties and related financial and brand damage.

However, a growing number of forward-thinking food suppliers have discovered that taking a different approach to certain aspects of their food safety program — namely the means by which EMPs are managed and analyzed — can result in achieving new business benefits. These benefits translate to a definition of ROI from advanced EMP workflow and analytics technology. This white paper will discuss multiple means by which organizations have reported finding this new business ROI, including detailed definitions of specific ROI categories and calculations related to new gains discovered through the use of automated data gathering and analysis within existing EMPs.

EMP Automation — Production, Waste, and Testing Program Efficiency Drive Business Impact

Automation of EMPs can yield significant business impact. Organizations that have adopted new EMP technology have experienced several business benefits; chief among these are the impacts on reducing production delays and unplanned shutdown, reduction of waste/scrap of finished product, and the overall efficiency of the testing program itself. The following sections provide details regarding how these impacts were discovered, as well as a means for calculating each performance improvement. All performance improvements have been shown to be derived from decreasing the "time-to-information" — specifically, information related to food safety issues.

The impact of accelerating time-to-information:

- Faster execution of corrective actions
- Reduced production delays/ stoppage
- Decrease waste/scrap
- Lowered cost of testing

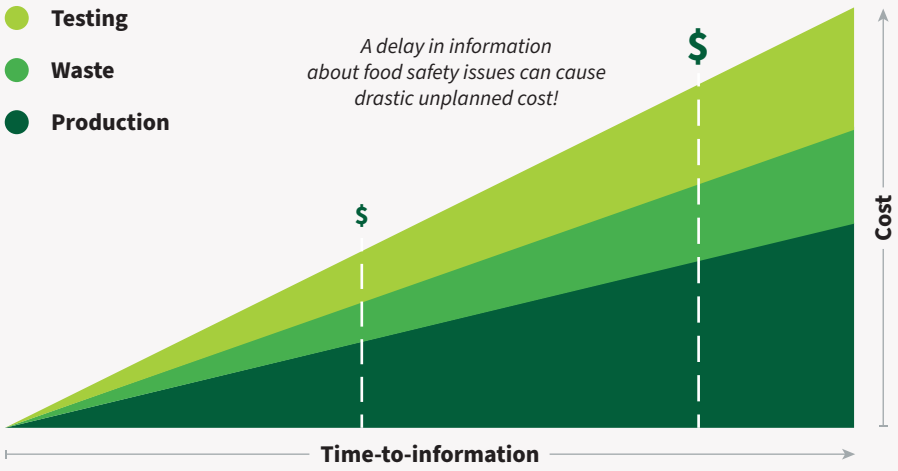


Figure 1: *"Time-to-information" Drives EMP Impact on the Business*

Production Performance

Food safety issues have the potential of causing disruption. When a pathogen is found to be present within a production environment, especially if it is discovered within a food contact zone or surface, a series of corrective actions must be launched. These actions can include a complex number of interdependent steps to ensure that the pathogen is removed, and verification of this result is documented and logged for future audit and inspection purposes. As corrective actions are being deployed, disruption to production is an almost certain result.

According to KPMG[1], 42 percent of food and beverage executives feel losing share to lower-cost producers is the biggest threat to their business model, and 46 percent say cost of inputs or merchandise is the greatest threat to their company's profit margins. To optimize operations, these industries have invested in automated systems that help keep plants running at top capacity.

[1] http://www.kpmg.com/us/en/topics/2013-outlook-surveys/pages/2013-food-beverageindustry-outlook-survey.aspx

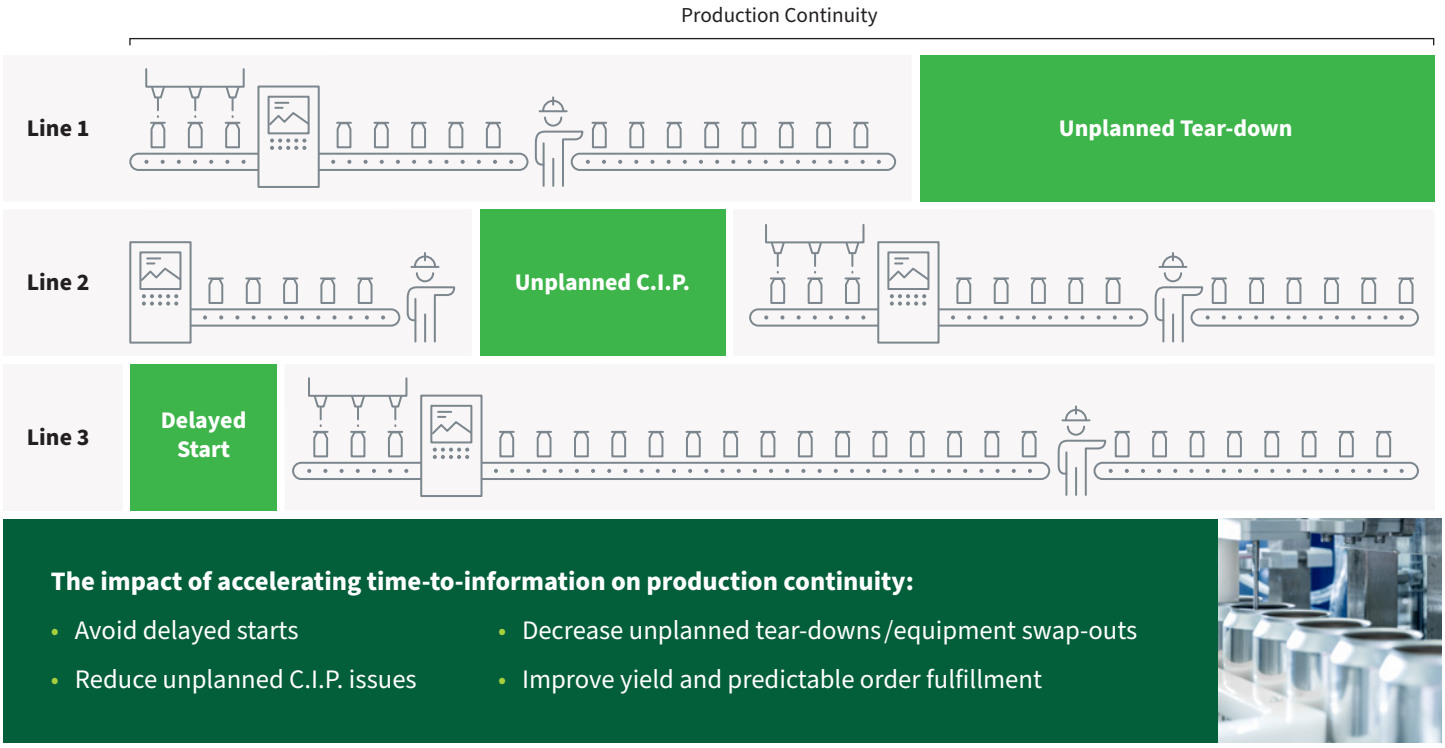


Figure 2: *Production Continuity Is Disrupted by Food Safety Issues*

These automated systems are critical to a plant's performance and, as a result, businesses' tolerance for downtime is at an all-time low. However, the occurrence and frequency of food safety issues increase the risk of system downtime. For example, if a pathogen detection occurs, a machine, conveyor system, or other equipment may need to be temporarily shut down for unplanned cleaning, or in extreme cases, torn down altogether for deep cleaning.

The research shows that downtime can reach an astounding 500 hours annually, leading to overall costs that some studies put in the range of $20,000 to $30,000 per hour on average. In extreme cases, an entire line could be shut down while more extensive investigatory testing is performed. This all results in production delays that inevitably yield an unexpected cost to the business.

Therefore, the ability to reduce production downtime caused by food safety issues has become an important focus of many food safety and production leaders. The difficulty of achieving this objective is highlighted by the fact that a food safety program, when deployed correctly, will, by its very nature, unearth pathogen, bacterial organism, and other contamination issues that can cause production delays.

This makes it essential that information collected as part of an EMP be accessible and rapidly utilized to enact corrective actions to reduce the impacts on production. Further, it becomes imperative that EMP data is fed into an analytics program that allows food safety professionals to discover the root causes and trends that lead to issues — thereby enabling a more proactive approach that can head off issues *before* they cause production delays and shutdowns.

The financial impact of reducing production downtime by just 90 minutes per week can be dramatic once the week-after-week results are added up. This is one of the most devastating costs that food manufacturers and processors face, yet it often goes undetected as teams focus on problem-solving in the moment, and chalk up downtime as simply an accepted cost of business. This does not have to be "just a part of doing business." By eliminating just a few delayed starts or unplanned re-cleaning instances, the financial gains can be significant.

The following equation shows the math involved in measuring the business impact of gaining 90 minutes of production uptime per week. For the purposes of this analysis, the "sample organization" depicted operates two facilities where there are assumptions that downtime equates to a cost value of $30,000 per hour, and that both plants experience an average of 90 minutes of downtime per week that can be regained.

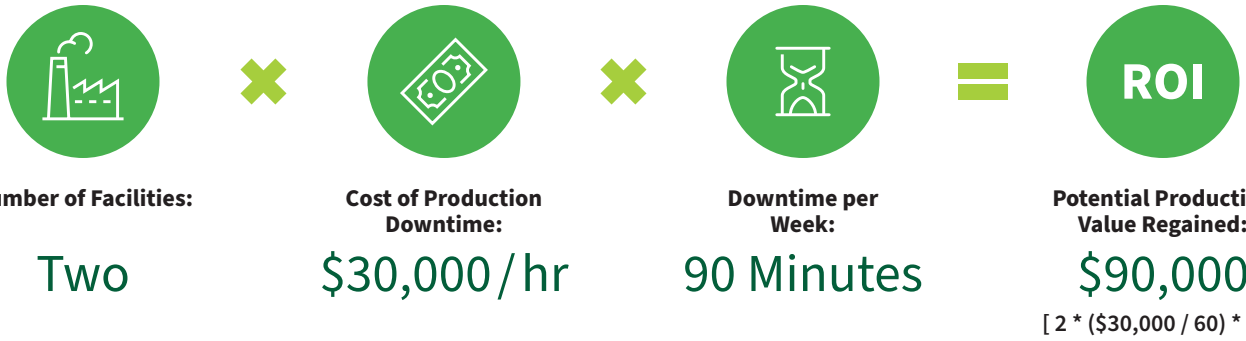


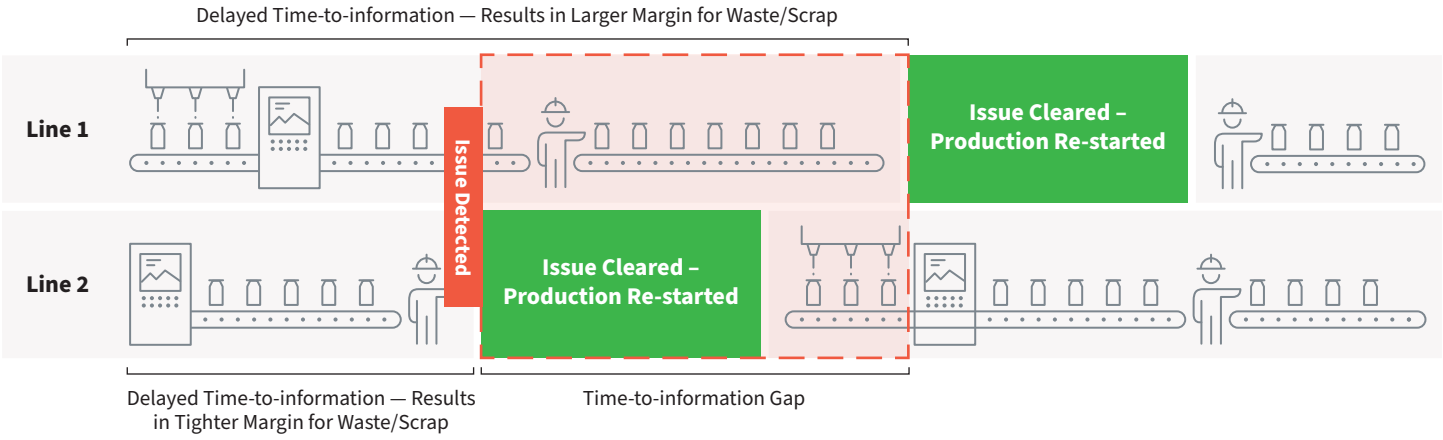
Figure 2.1: *EMP Impact — Example Production Up-time ROI Calculation*

Food safety issues of various levels of seriousness were shown to occur at least once per week across multi-facility organizations. If this is more frequent, the ROI could be potentially higher.

Reducing Waste / Scrap

In the United States, fully one-third of all food manufactured is scrapped. Much of this due to preventable food safety and quality issues. The costs associated with producing finished product vary among food sub-segments, but overall, they involve cost factors such as raw materials, facility energy, labor, packaging materials, and storage.

Every pound of finished product that is scrapped will require re-work to make up for lost order fulfillment for customers, which involves re-spending all or a portion of the costs listed above. Additionally, the end result involves the added burden of storing affected food product for quarantine and testing purposes as well as removing the scrapped goods in the form of waste management costs.



The impact of accelerating "time-to-information" on waste/scrap:

- Reduce waste/scrap
- Avoid unplanned materials/ingredients costs
- Decrease overtime related to re-work
- Improve yield and predictable order fulfillment

Figure 2.2: *The Impact of EMP "Time-to-Information" on Waste/Scrap Performance*

Interviews with a variety of food suppliers revealed a universally accepted business challenge, regardless of the food type produced: *The later in a processing or manufacturing run that issues are found, the more waste is produced.* It is therefore imperative that when issues are detected, the associated corrective actions accurately point to the affected food product and are completed as soon as possible to limit the amount of material that is scrapped.

Food suppliers generally lack rapid access to the information and visibility to relevant data that is required to reduce reaction times and affects the financial impacts of scrapping finished product. Many EMPs are managed via a weekly reporting process that involves collecting data from texting activity, aggregating it, analyzing it, and reporting on it on a weekly basis. These information management tasks are often managed within a combination of paper and spreadsheet-based files.

At this pace, several days of production can be at risk of being scrapped when pathogen and bacterial contamination issues are discovered during a weekly review process. The incremental visibility to relevant data needs to be accelerated to near real-time. But with thousands of tests occurring during an ever-moving production schedule, how can food safety and production teams keep pace?

Automated EMP systems enable the realization of this goal. An automated solution should enable the data itself to drive alerts and point to issues as they are discovered, leaving the weekly reporting and analysis cycle behind. This is accomplished through the definition of rules that trigger the system to analyze diagnostic results data. Any time a value is discovered to be out of range, or outside of the rules (such as a positive diagnostic finding for a pathogen, or a bacterial count above acceptable ranges), the system automatically alerts stakeholders to the existence of such information. This enables near real-time reaction to occur, and food product to be identified and quarantined *before* the production run is entirely wasted.

The following equation shows the math involved in measuring the business impact of gaining back just 10% of scrapped food per week. For the purposes of this analysis, the sample organization depicted operates two facilities where there are 500 lbs. of finished product scrapped each week, and the value per pound of finished product is $1.

Figure 2.3: *EMP Impact — Example Waste/Scrap Reduction ROI Calculation*

Improving Testing Program Efficiency — A Case Study

As a staple food group, dairy products have been, and continue to be, among the most regulated foods in U.S. history. It comes as no surprise then that dairy manufacturers and their food safety teams are constantly looking at how their current EMP is performing.

Over the course of several months, we partnered with a large dairy producer to explore the challenges they faced with their EMP, and how automating a manual process helped to drive increased efficiencies, reduce pathogen positives, and ultimately, improve the bottom line.

The Challenge

For a large dairy product manufacturer with facilities spanning multiple countries, there is no question of the amount of pressure the organization is constantly under when dealing with the safety of its products, and the resulting brand reputation risks that must be managed. At the start of the study, the EMP across all locations was very manual in terms of both the workflow and information management involved, as well as data management.

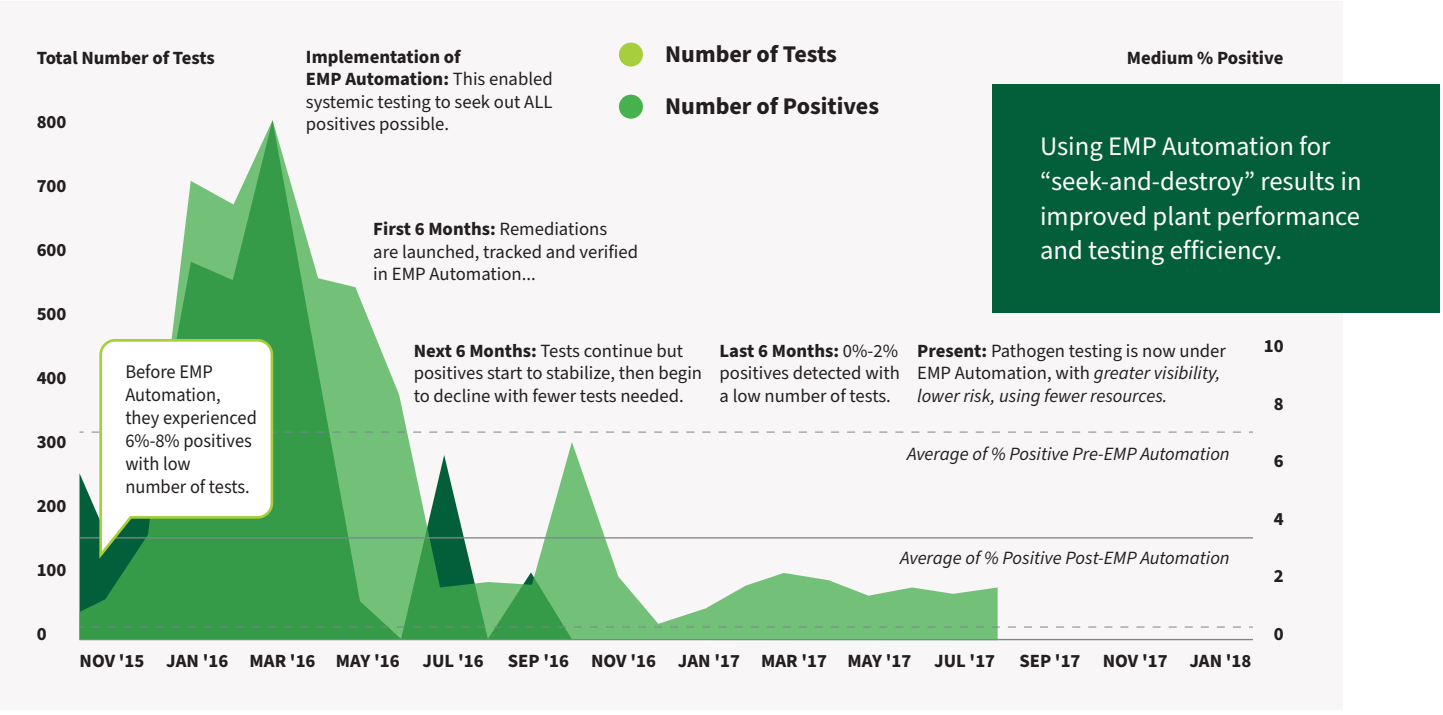
More troubling was the fact that, on average, the company saw a positive pathogen hit rate of 6%–8% with a low number of tests being performed. The company became concerned with not knowing if the number of tests, types of tests, and location of tests were giving them the data needed. They believed this problem could be solved by automating their current EMP and gaining access to a larger set of testing data while expending less effort to do so.

The Approach

The dairy products company realized that to identify the correct number, location, and type of tests, they first needed to increase overall testing to see where all of the existing issues were occurring. At the start of the study, the company invested in an increased volume of systematic pathogen testing schedules to seek out and find all presumed positives within their facilities. This approach helped them identify all areas where issues existed and better informed them about the effectiveness of their sanitation efforts.

At first, as testing increased, so did the presumptive positive results. Over time, as the new sanitation procedures were implemented, fewer positive results were found. As the study continued, a new baseline of testing, test types, and correlated sanitation procedures was refined and implemented. This resulted in a revamped remediation program that included a collection of corrective action steps that have been proven, through the study's data, to be more effective.

Figure 3: *EMP Impact – Automated EMP Testing Drives Reduced Positives and Proper Testing Volume/Types*



The overall financial result? While the company did see a significant jump in lab fees for the increased testing required for the early phases of the study, they realized an overall drop in remediation costs over time that halved their labor and materials costs for testing in just one year.

The positive hit rate reduction, combined with a leveling of the swabs per month volume, provided a more efficient means of budgeting and operating their EMP workflow, rather than the crisis-mode approach of the past. As a result, they reduced associated costs of waste, rework, delayed production starts, and downtime that were caused by frequent food safety issues. Just 15 minutes of production time gained back per facility yielded many multiples of the cost of the study.

Conclusion

The wave of digital transformation is coming to a crescendo within the food safety functions across the food and beverage industry. The advancement of access to and analytical use of data to drive the production of safer food has also yielded new business benefits. Forward-thinking food brands and ingredients producers are realizing these benefits today, through the adoption of workflow automation, data gathering, and advanced analytics capabilities.

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