ACHIEVING OPERATIONAL EXCELLENCE IN FOOD & BEVERAGE

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Report Highlights

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The combination of pressures around rising operational costs, production efficiency, and product quality form a complex operating environment for the food & beverage industry as a whole.	Leaders in F&B start by focusing on production efficiency to achieve OpEx. They outperform their peers when it comes to asset downtime, OEE, and yield.	Leaders don't lose sight of product quality, achieving 99% production compliance; while at the same time possess a lower total cost of quality than Followers.	While sustainability related costs are often overlooked this is not true for Leaders, who have seen decreases year-over-year in energy, wastewater, and % to landfill expenses.

Based on the experiences of over 170 respondents, this report explores how Food and Beverage (F&B) manufacturers achieve operational excellence. Specifically, how Leaders in the industry focus on three key areas of their operations — production efficiency, product quality and safety, and sustainability costs — to succeed as a business.
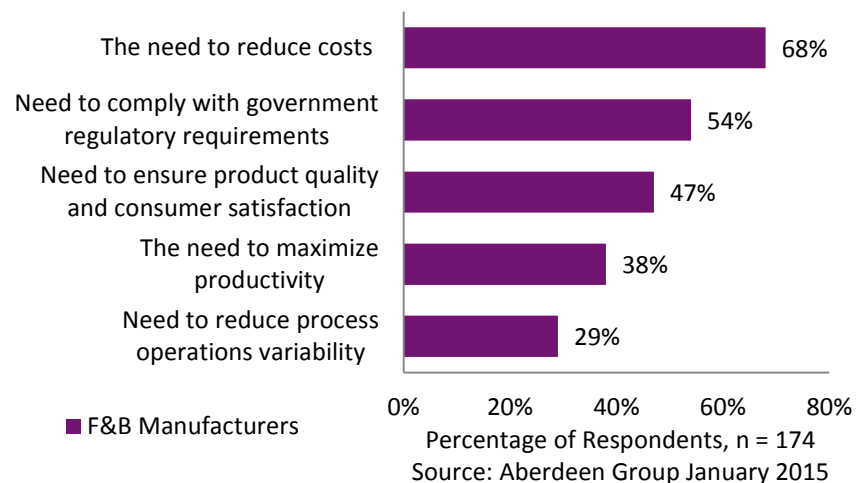
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The combination of pressures around rising operational costs, production efficiency, and product quality form a complex operating environment for the food & beverage industry as a whole.

Sector Definition

For the purposes of this study, Aberdeen Group defines Food and Beverage (F&B) manufacturers as those that supply bulk packaged food to down-stream F&B consumer-facing firms. In general, these organizations can be either large or small, but very often don't own consumer brand name assets.

Operational Excellence (OpEx) has long been a philosophy that manufacturers have striven to achieve. For an industry like Food and Beverage, this is a challenging endeavor as the environment these companies operate in can be complex. The products F&B companies produce have a direct impact on the health and safety of their consumers. This relationship with the consumer, combined with the jump in high impact food recalls over the past few years, has put an increased spotlight on product quality. However, these companies still have to handle the pressures that more traditional manufacturers face, such as the need to improve operational efficiency, cut costs, and differentiate their products from competitors. As a result, F&B manufacturers are struggling to compete in this interconnected and highly complex environment.

Being Successful in a Complex Environment

Executives in the Food & Beverage industry are generally managing enterprises that are asset intensive, at the mercy of global commodity markets, and face both low margins and high demand variability. Given these industry characteristics, companies must find new ways to achieve operational excellence.

Figure 1: Top Pressures to Achieve OpEx in F&B

The need to reduce costs — 68%
Need to comply with government regulatory requirements — 54%
Need to ensure product quality and consumer satisfaction — 47%
The need to maximize productivity — 38%
Need to reduce process operations variability — 29%

■ F&B Manufacturers

Percentage of Respondents, n = 174
Source: Aberdeen Group January 2015

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Cost has always been king for manufacturers, especially in F&B (Figure 1), as margins are razor thin. These costs come in many forms, from material and labor costs, to packaging and shipping expenses. However, a large portion of operational costs for Food & Beverage manufacturers are sustainability-related (energy, water, wastewater, etc.). In the past these costs were primarily viewed as givens — just the cost of doing business — but that mindset is beginning to change in F&B. Indeed, over a third of F&B respondents (37%) identified these costs as the top area they are looking to improve upon going forward to differentiate themselves. Limiting these costs is a challenge of its own, and as the sidebar shows, justifying these efforts is the largest hurdle to get past. Still, a reduction of even a small percentage in energy or water consumption can result in millions of dollars saved over time.

Also, although it is listed as the 4th pressure in Figure 1, maximizing productivity and cost reductions go hand-in-hand. Improvements in yield reduce the amount of waste that occurs in the form of scrap and rework, unscheduled asset downtime results in higher maintenance costs, late shipments, and lost business. Clearly, there is a direct correlation with improving production efficiency and lowering operating costs. Maximizing productivity is easier said than done though. The top challenge identified by F&B respondents when trying to increase their production efficiency is the need to improve repeatability and decrease variations in production processes (38% of respondents). Methodologies like Lean and Six Sigma are seeing a resurgence in manufacturing to help ensure predictablity and cut out waste from production processes.

While the need to reduce costs and maximize productivity are pressing concerns for all Food and Beverage manufacturers, these organizations also realize that product quality and

Top Challenges for Sustainability

Food and Beverage respondents were asked to select the top two challenges they feel impact the success of their sustainability initiatives:

Measuring the Return on Investment (ROI) for sustainability initiatives: 45%

Many other projects are competing for resources: 43%

Getting buy-in across the organization: 25%

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"Food safety and our consumer's experience is one of our organization's top priorities. This focus starts right from the top, with our CEO's constant message to the company on the subject, 'We are all just one bad meal away from bankruptcy.'"

~ CFO, Large Food Processor

compliance are equally as important. The introduction of regulations like the Food Safety Modernization Act (FSMA) has caused major changes in how Food & Beverage manufacturers focus on the safety and quality of their products, as well as how organizations will have to handle any issues. Tighter control, documentation, and tracking of every ingredient and process used throughout the enterprise is now required. Even though FSMA was signed into law back in 2011, companies today are still scrambling and focused on complying with this continually evolving mandate and others like it (HACCP, GFSI, FSIS, etc.). These regulations are all geared towards the same goal — keeping the products that customers consume safe and of the highest quality. Unfortunately, maintaining compliance to these regulations adds additional costs and complexity to F&B operations.

The main issue is that all of these pressures are interconnected and combine to form a complex operating environment for the Food & Beverage industry. The challenge is reducing your overall costs and maximizing productivity, while maintaining quality in your products. The combination of all of these concerns is driving F&B manufacturers to question both the efficiency and methods of their current approach. Luckily there is hope as there are companies in the industry that have taken steps to succeed in all three aspects.

Defining Leaders among F&B Manufacturers

Aberdeen Group used four key performance criteria to distinguish the F&B Leaders from Follower organizations. These criteria included metrics that measure an organization's ability to respond to pressures around compliance, operational efficiency, customer satisfaction, and margins. Table 1 summarizes the criteria used to define Leaders and Followers, and the respective performance of each group.

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Table 1: Top Performers Earn Leader Status

| Maturity Class	Mean Class Performance
F&B Leaders: Top 30% of F&B aggregate performance scorers	99% Production Compliance 89% Overall Equipment Effectiveness (OEE) 98% On Time and Complete Shipments 3.7 Hours Response Time to Non-Conforming Shipments +9% Operating Margin vs. Corporate Plan
F&B Followers: Bottom 70% of F&B aggregate performance scorers	92% Production Compliance 74% Overall Equipment Effectiveness (OEE) 86% On Time and Complete Shipments 23.2 Hours Response Time to Nonconforming Shipments -5% Operating Margin vs. Corporate Plan
All F&B Manufacturers: All F&B aggregate performance scorers	94% Production Compliance 80% Overall Equipment Effectiveness (OEE) 91% On Time and Complete Shipments 16.1 Hours Response Time to Nonconforming Shipments -1% Operating Margin vs. Corporate Plan

Source: Aberdeen Group, January 2015

The metrics above clearly indicate the ability of Leaders to manufacture and deliver compliant products in an efficient manner. Also, if a non-conforming product has shipped, it takes on average less than four hours to locate and hold the product after detection. This is a stark difference from the Followers. Not only are Followers less efficient and less likely to meet delivery targets, but they also take almost a full day to respond to shipments with quality issues. This greatly limits their ability to minimize disruption and quickly identify a root cause. Without the ability to track and trace shipments quickly, the risk and impact of recalls can be substantial. As we will see, Leaders in the industry accomplish such superior performance by implementing capabilities and technologies that improve the three areas identified earlier — production efficiency, product quality and sustainability.

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Building the Foundation for Operational Excellence

The first step every company should take (no matter the industry) if they truly want to achieve operational excellence is to get control over their manufacturing data. Effective decisions are always based on data analysis and information, not speculation or conjecture — this is no different for manufacturing related decisions. Automated data collection is the basis for creating the real-time enterprise, and differentiates top performers from their poorer-performing peers (Figure 2).

Figure 2: Getting Control of your Manufacturing Data

Percentage of Respondents, n = 174
Source: Aberdeen Group, January 2015
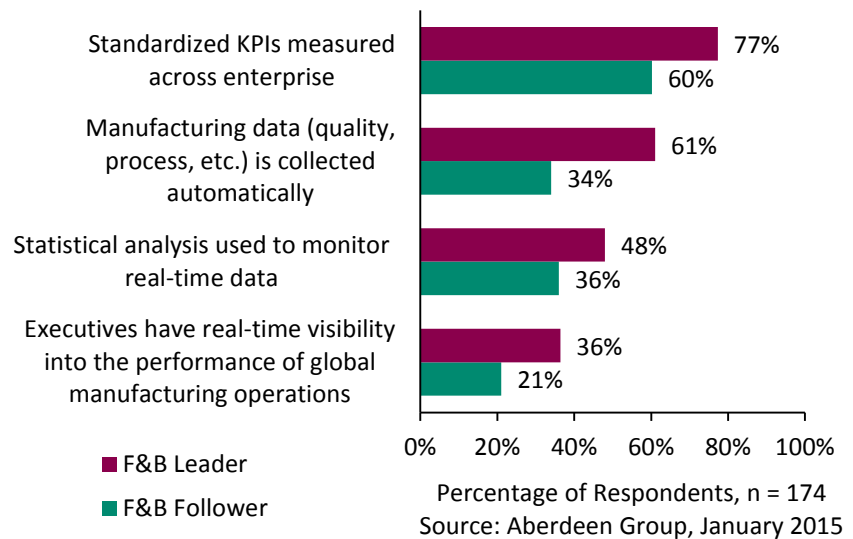
This level of automation allows manufacturers to improve the validity of collected data, more effectively use historical data to optimize current decision making, and deliver data in real-time to decision makers as actionable intelligence. In a manual data collection environment, like Followers are more likely to rely on, the data can be old and inaccurate, calling into question the validity of conclusions drawn by the analysis. This automation is further utilized by Leaders, as they are 33% more likely than Followers to conduct statistical analysis on their data, turning it into insight. Analyses like statistical process control (SPC) or
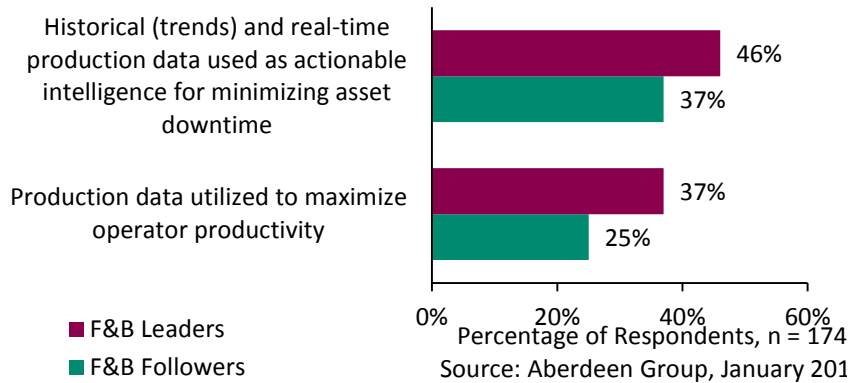
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failure mode and effects analysis (FMEA) can be undertaken in real-time to improve the reliability and predictability of manufacturing processes.

Next, in an effort to synchronize operational and corporate performance, while easily providing visibility into operations, the entire business must use the same yardsticks. Large multinationals, especially with manufacturing operations across the world, have challenges to make sure that performance in all plants is measured in the same way so that the best business decisions can be made for the organization. When executives have the same understanding of how operations are performing in each location, they can take steps to address any shortcomings, and ensure that lagging plants improve performance to meet corporate goals.

Maximizing Production Performance

Having access to operational data is important, but what matters more is turning that information into actionable intelligence. With this control over manufacturing data, Leaders can begin to focus on the first critical area of operational excellence — production efficiency (Figure 3). By having robust data like this at hand, F&B manufacturers can see how a particular asset has historically performed, and compare that to how it is running in real time. This is crucial in determining whether an asset is running at its peak or if maintenance is needed. In addition, by using trending data and predictive analytics, companies are able to predict adverse events and downtime before they occur. Leaders provide this information on-demand, thus enabling easier information access, which reduces unscheduled downtime, lowers maintenance costs, and improves asset performance.

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Figure 3: Improving Production Efficiency

Historical (trends) and real-time production data used as actionable intelligence for minimizing asset downtime — 46% / 37%

Production data utilized to maximize operator productivity — 37% / 25%

F&B Leaders
F&B Followers

Percentage of Respondents, n = 174
Source: Aberdeen Group, January 201

The Impact on Production Efficiency

Food & Beverage Leaders, in addition to performing better as an overall business, outperform their peers on production centric metrics:

Unscheduled Asset Downtime:
- *F&B Leaders – 4.6%*
- *F&B Followers – 8.9%*

Overall Equipment Effectiveness:
- *F&B Leaders – 89%*
- *F&B Followers – 74%*

Yield:
- *F&B Leaders – 97.8%*
- *F&B Followers – 87.9%*

Analysis can also be conducted to improve operator productivity, an action Leaders are 48% more likely to take. Often there are hidden inefficiencies in the handling of materials which results in wasted time and resources. An initiative like raw materials management is often a low hanging fruit for a F&B organization to explore, as it helps to effectively minimize scrap, as well as maximize yield and throughput. Also, Leaders are 79% more likely to be able to plan and forecast for demand. In Food and Beverage, this is an essential skill in order to manage perishable materials to keep costs low. Also, by constantly monitoring their processes, Leaders can dynamically assign operators to complete tasks in real-time as changes occur within their operations. It is the combination of these capabilities that have such an impact on production efficiency. Leaders are more likely to implement these capabilities, and the productivity results speak for themselves (see sidebar).

Product Safety and Quality Cannot be Sacrificed

While optimizing the plant performance is an important goal, this cannot come at the cost of product quality. When it comes to food safety and quality, process capabilities are perhaps the most critical area of differentiation for successful companies.

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Because of this, Leaders focus on aligning their quality initiatives to support proven industry standards (Figure 4).

Figure 4: Make Compliance Integral to Production
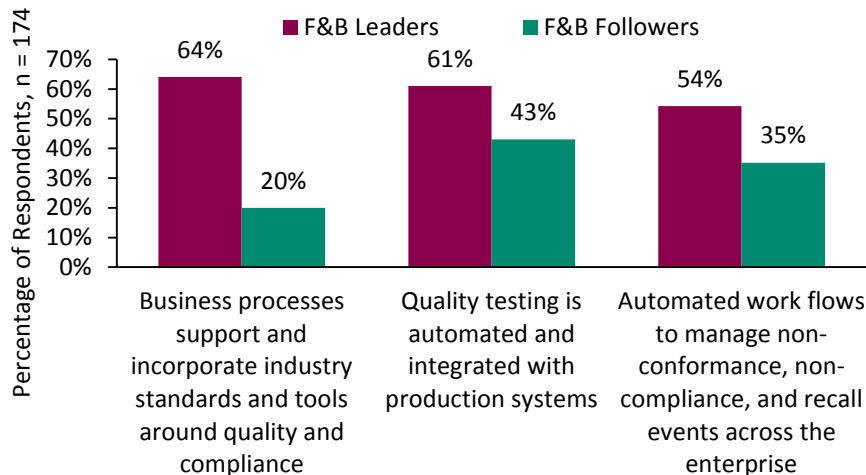
Source: Aberdeen Group, January 2015

These standards can be used to improve production processes and develop best practices. It is also important to put in place the change control and audit trail tools needed to ensure that standards are adopted and maintained over time. By not supporting these standards from the start, Followers are consistently addressing compliance concerns throughout production, severely impacting productivity and overall performance.

Not only are Leaders utilizing compliance standards to improve their processes, they are integrating quality results directly into their production systems. Providing this quality insight throughout the enterprise gives operators the ability to stop quality problems from the onset — preventing off-quality from occurring in the first place, stopping non-conforming products from being shipped, keeping customers happy, and eliminating the risk of costly recalls. Leaders understand that improving

"To give you some perspective on how important food safety and traceability is to our organization: All Cap-Ex and Op-Ex requirements for implementing the needed tools for tracing and tracking product across the supply chain receive an easy 'green light' to execute at both the executive and board level."

~ Chief Technology Officer
Large Soft Drink Bottler

"Traceability is the ability to trace and follow raw materials, work in process and finished products through all stages of receipt, production, processing, and distribution. We apply controls and monitoring at critical traceability points across our operations. These are specific to the process, location, material and product complexity, and routes to market. Currently we apply the 'one up / one down' approach."

~Manager of Food Safety, Medium sized Food Manufacturer

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The Impact on Product Safety and Quality

Food & Beverage Leaders, in addition to performing better as a business, outperform their peers when it comes to quality. Not only do Leaders have superior production compliance, they do so while maintaining a lower total cost of quality (percentage of annual revenue).

Production Compliance:
- *F&B Leaders – 99%*
- *F&B Followers – 92%*

Prevention costs:
- *F&B Leaders – 3.8%*
- *F&B Followers – 4.9%*

Assurance costs:
- *F&B Leaders – 2.8%*
- *F&B Followers – 4.5%*

Internal failure costs:
- *F&B Leaders – 2.7%*
- *F&B Followers – 5.2%*

External failure costs:
- *F&B Leaders – 2.7%*
- *F&B Followers – 3.8%*

quality comes directly from the systematic monitoring and analysis of standardized processes.

However, an important aspect of quality management to not overlook is having a plan in place if a non-conformance does occur. The risk of a recall is always in the back of mind for Food and Beverage manufacturers. From tomatoes and spinach to ground beef and peanuts — all types of products have experienced issues with quality and recalls in the past. The cost of a recall goes well beyond the expense of replacing an order or paying for damage caused by consumption. There can be significant tarnishing of the brand name and lowered trust in the company. It takes only one quality issue to potentially lose a customer for life. That is why possessing automated workflows to manage and escalate these events is so critical to food and beverage manufacturers — and not suprisingly, Leaders are 54% more likely to have in place.

This increased focus on compliance implies an increase in the total Cost of Quality (COQ) for Food & Beverage companies. However, when we examine Leaders among F&B companies (see sidebar) we see that they do a great job of ensuring compliance while limiting their COQ. For all four COQ metrics, the Leaders outperform the Followers, and when we look at the metrics as a whole, the gap is even more apparent (12% of annual revenue for Leaders, 18.4% for Followers). As the aphorism goes "Highest quality is lowest cost" — building compliance and traceability into their processes has led to such improved performance for the Leaders. Effective food safety and quality is essential for manufacturers today, and by focusing on this area of the business, Leaders are set up for success in both the short- and long-term.

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Sustainability is Often an Untapped Source for Savings

Improving production efficiency and ensuring top quality are important for financial success, but reducing the energy needs of the enterprise is an often untapped resource in both the quest for profits and social responsibility. Sustainability-related costs (energy, water, wastewater, etc.) are a large percentage of the total operational cost in most Food & Beverage plants. Leaders understand this and are more likely than their competitors to factor sustainability into their operational decision making (Figure 5).

Figure 5: You Can't Forget about Sustainability
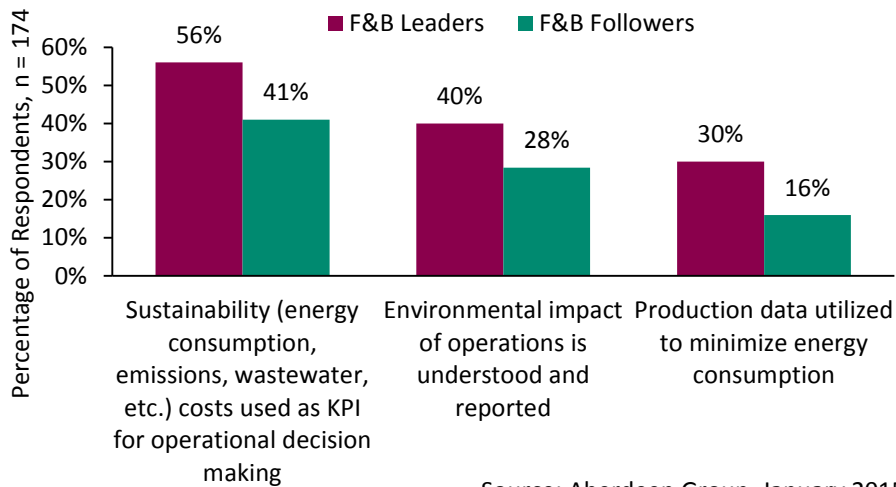
Source: Aberdeen Group, January 2015

The only way to make improvements is to know how you are performing. Including energy data in the optimization process and using it as a KPI for decision making will enable companies to reduce their total operating costs; the top pressure driving F&B manufacturers. This means that Leaders collect sustainability data in a single repository and provide this information to key decision makers. It is also important to connect this sustainability information with production data. Understanding how your energy costs vary with product mix,

"We have started a formal energy management program and hired an energy manager. This has resulted in savings of approximately 6% electricity, 5% gas, and 3% water in first year with no capital costs. We are currently installing sensors on the electrical side and lighting upgrades, also installing a new control system on our refrigeration plant, as this is the largest load."

~ EH&S Manager, Small Dairy Producer

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The Impact on Sustainability Costs

Food & Beverage Leaders, in addition to performing better as an overall business, outperform their peers on sustainability centric metrics:

Energy Management Goals vs. Corporate Plan:
- *F&B Leaders – +10%*
- *F&B Followers – -8%*

Change in total Wastewater costs*:
- *F&B Leaders – 15% Decrease*
- *F&B Followers – No Change*

Change in total Energy Consumption*:
- *F&B Leaders – 14% Decrease*
- *F&B Followers – 1% Increase*

Change in % to Landfill*:
- *F&B Leaders – 5% Decrease*
- *F&B Followers – 3% Increase*

*Year over year change, normalized for identical production levels

"Meat products are high value consumable products, so the more you manage the yield, the better you can optimize margins, which goes straight on the bottom line."

~ Chief Information Officer, FoodCap International Limited

production volumes, and schedules is critical to improving efficiency.

Gaining a full understanding of the environmental impact of operations is also important. For example, if a wastewater treatment plant is performing poorly, it can result in excessive biological oxidation demand (BOD) when treated effluent is released. This can result in violations of local discharge permit limits and further add cost to the business. By collecting and analyzing sustainability information, Leaders are more likely to understand such environmental concerns and address them before they become an issue.

Again, the importance of these capabilities is shown when examining the metric performance of Leaders and Followers (see sidebar). Leaders have seen all of their primary sustainability related costs decrease over the past year, while Followers have seen no change or even an increase in costs. As we saw earlier, justifying sustainability initiatives is the number one challenge F&B manufacturing companies must get past. With the approach that Leaders take to sustainability, the reductions in costs provide all of the justification needed to make this part of the executive's agenda.
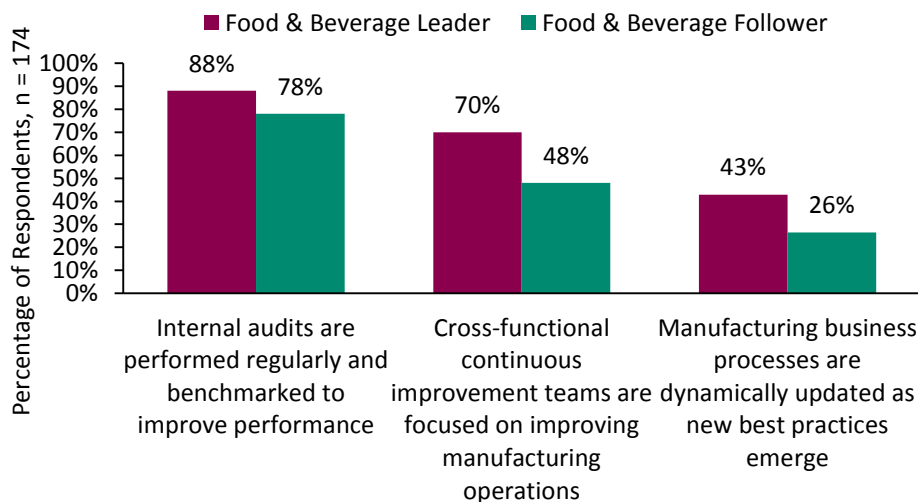
Operational Excellence and Continuous Improvement

Operational Excellence must be viewed as an ongoing, evolving process where there is always progress to make. Continuous improvement is a very important mindset (one that all manufacturers are very familiar with) to strive for. For Food and Beverage Leaders it starts with regular audits to provide visibility into historic and current operational performance (Figure 6). You can't improve what you don't measure; having these benchmarks available allows F&B Leaders to improve metrics like yield, productivity, and ultimately, profitability.

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Furthering these efforts, Leaders form cross-functional teams aimed at improvements across the enterprise. These teams are well proven tools to drive buy-in throughout the organization and help to change culture. Leaders have gone all-in for Lean, Six-Sigma, and other continuous improvement techniques that keep all their manufacturing business processes running at peak efficiency. Finally, as data is turned into insight and inefficiencies are identified, business processes must be updated across the enterprise as these best practices are discovered. Leaders are 65% more likely than Followers to have a formal process in place to dynamically incorporate best practices.

Figure 6: Stressing Continuous Improvement

Source: Aberdeen Group, January 2015

Incorporating continuous improvement practices is the final step for achieving operational excellence. Small improvements add up over time, and the companies that perform the best as a business are the ones that are never satisfied. Leaders take this to heart, and the benefits to the business are clear when examining the performance on the three key aspects identified for operational excellence in F&B.

Analytics to Bolster Continuous Improvement

Analytics are used to provide predictive insights based on the captured data:

- F&B Leaders - 37%
- F&B Followers - 25%

"In terms of consumer safety and satisfaction, this is at the very top of our pyramid in terms of investment prioritization. We review food quality weekly as part of our Sr. Management meeting. Regarding technology, ERP is the foundation for quality management, which includes lot control and traceability. At the manufacturing plant level, we also use a Manufacturing Execution System to ensure lot traceability and compliance for goods, movement, and consumption. At the supply chain level, tracking product is an integral part of our overall business process."

~Vice President, Large Food Manufacturer

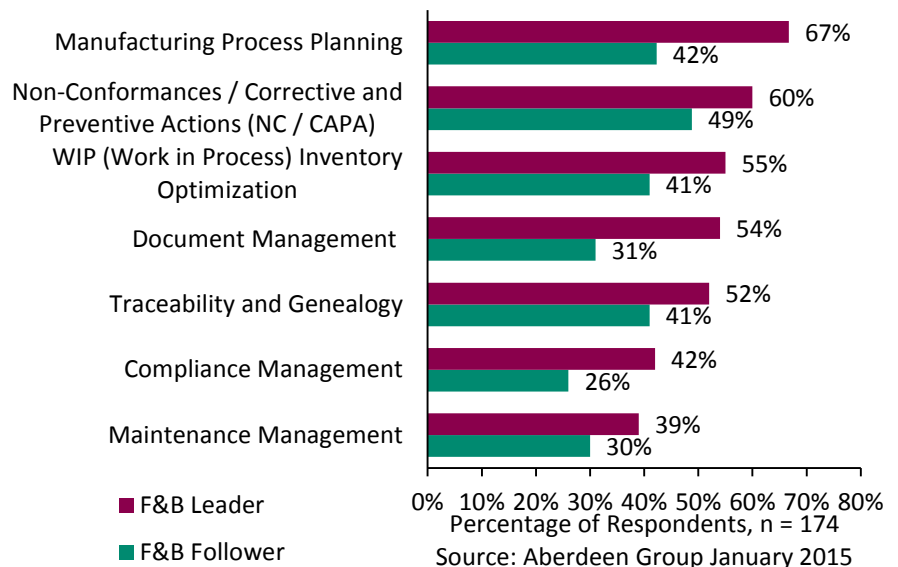## Benefits of Eliminating Manual Data Collection Processes

Top benefits seen from automating internal processes (All Respondents):

- **Increased visibility:** 49%

- **Reduced operator error**: *40%*

- **Reduced response time:** 37%

- **Increased operator efficiency**: *33%*

- **Promotes effective decision making**: 31%

The Importance of Having the Right Tools

In order to support these OpEx goals, Food and Beverage manufacturers must rely on technology to provide the necessary visibility and communication across the enterprise. Enterprise systems (like ERP, QMS, MES, SCM, etc.) go a long way towards creating the needed foundation in processes control and automation that Leaders use to enable the capabilities that were just discussed. It's all about the breaking down of silos between functional groups that standalone solutions can bring. Combining systems into one overall solution creates a platform for cross-functional communication and collaboration that synchronizes and ingrains operational excellence across the value chain. Leaders also focus on automating their processes with technology to ensure that OpEx initiatives can be effectively carried out (Figure 7).

Figure 7: F&B Leaders Digitize Their Processes

Process	F&B Leader	F&B Follower
Manufacturing Process Planning	67%	42%
Non-Conformances / Corrective and Preventive Actions (NC / CAPA)	60%	49%
WIP (Work in Process) Inventory Optimization	55%	41%
Document Management	54%	31%
Traceability and Genealogy	52%	41%
Compliance Management	42%	26%
Maintenance Management	39%	30%

Percentage of Respondents, n = 174
Source: Aberdeen Group January 2015

A large portion of hardships felt in manufacturing can be attributed to the manual or paper-based systems that are being relied upon. These systems are simply not accurate enough and

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cannot provide the necessary visibility that Leaders rely on. Demonstrating compliance to Food and Beverage specific quality standards and optimizing asset performance is too time-consuming when going through three-ring binders or notebooks of production data. Smaller or fast-growing companies are the most likely to still manage production through these methods, which simply cannot scale with the business. This puts this group at the highest risk, as they may not even be aware of a problem until it is too late. Also, one of the primary drivers for "digitizing" all the paperwork in F&B is being able to extend traceability into the distribution network.

In the analysis of specific technology functionalities enabling Leading performance, it was found that these functionalities span the plan, make, maintain, and deliver business processes fairly evenly without any clear winner. Therefore, in assessing where any organization should invest, it is important to first understand which of these processes are most important for success, and where gaps in technology investment currently exist.

Key Takeaways and Recommendations

Food and Beverage manufacturers face constant pressures around costs, quality, and efficiency. Making effective decisions to address all three of these concerns can be a major challenge for companies that are not properly structured. The operational excellence program that Leaders rely upon is one that aims to maximize productivity, ensure product quality, and limit sustainability costs. Those Food and Beverage manufacturers looking to achieve the same level of operational excellence should:

Food and beverage Leaders are 30% more likely than Followers to use automated dashboards.

These applications help reduce the overwhelming load of real-time events and automate the monitoring and analysis of critical indicators that impact performance.

Survey Demographics

Total Respondents: 174

Revenue Size:
- *21% Small (under $50 Million)*
- *37% Medium ($50 Million - $1 Billion)*
- *42% Large (Over $1 Billion)*

Geography (Headquarters):
- *63% North American*
- *19% Europe*
- *12% Asia Pacific*
- *4% South/Central America*
- *3% Middle East, Africa*

Sub-Verticals:
- *53% Packaged Foods*
- *47% Food Service*
- *36% Distributor*
- *33% Juice*
- *27% Frozen Food*
- *24% Dairy*
- 24% Beef

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➔ **Improve the flow of manufacturing data across the enterprise to increase visibility and optimize performance.**

➔ **Build the unique F&B compliance and safety mandates into your production processes.**

➔ **Establish role-based visibility and automated workflows in the case of a quality, non-compliance, or product recall event.**

➔ **You can't overlook sustainability costs — factor the environmental impact/costs into operational decision making.**

➔ **Implement enterprise systems like ERP, QMS, and MOM/MES to build the foundation of process control and automation that Leaders rely upon.**

➔ **Digitize your manufacturing processes (Document management, WIP, HAACP, etc.) to eliminate inefficient paper-based systems and provide a timely, unified picture for decision makers.**

➔ **Operational Excellence is an evolving journey; take a continuous improvement mindset to your operations.**

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