Solidify Startup Success

EXECUTIVE SUMMARY

New product launches are one of the more difficult challenges manufacturing managers face. When things are done right, the startup moves forward with challenges, but when things aren't correctly in place on the front end, big trouble is coming with devastating consequences.

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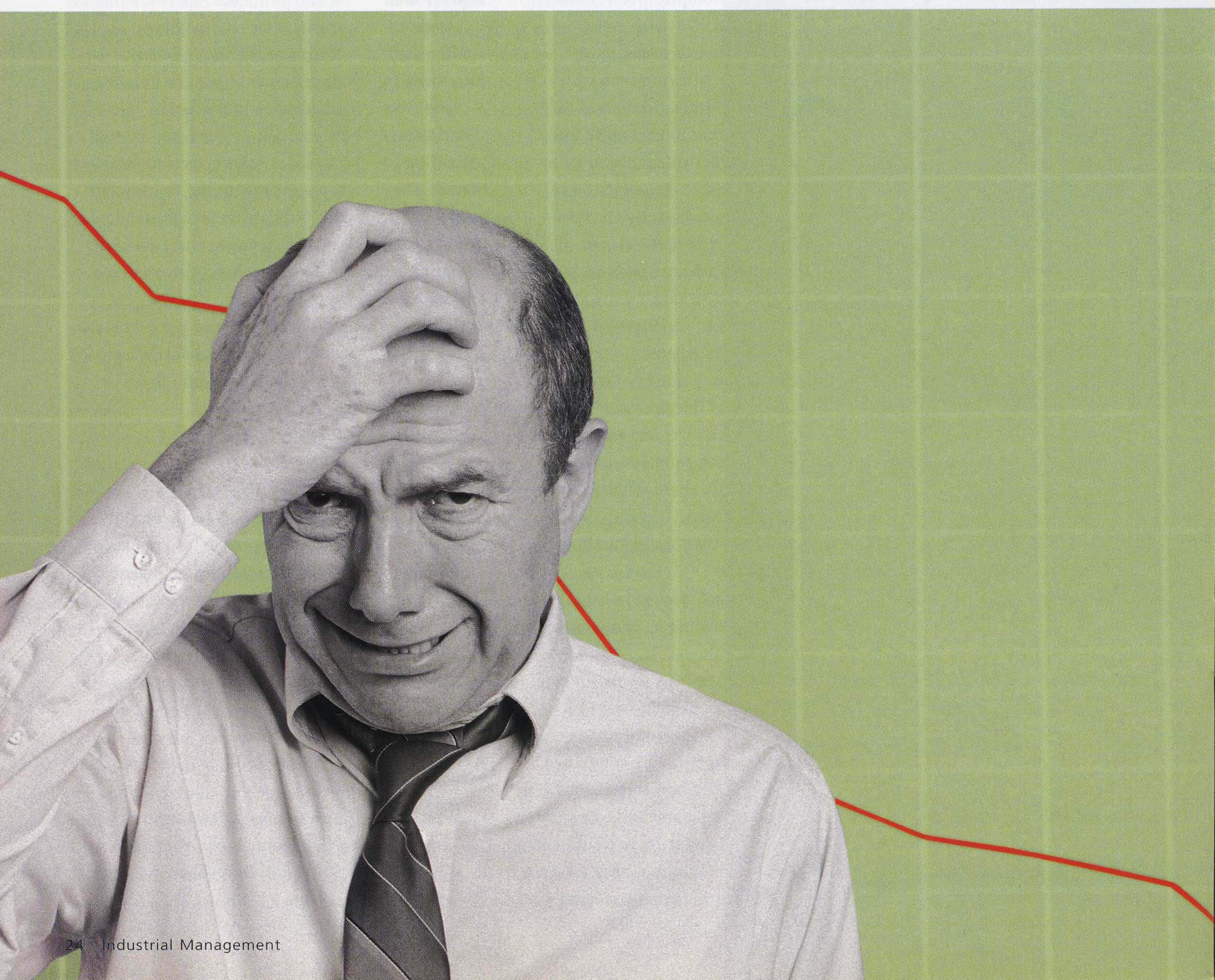

The call came on a Thursday night. "Could you get to our plant in Indiana as soon as possible?" the executive asked with obvious tension. "We have some critical production issues with a new product launch and we need some serious help to dig out of a pretty big hole," he added. We assumed he would ask us to stop in some time the following week to get started, but instead he said, "I'll look forward to seeing you tomorrow ASAP, and please drive carefully," before hanging up.

We were about to embark on an emergency house call to a plant that was in dire straits because of a new product manufacturing startup gone bad. It has been said that failing to plan is truly planning to fail. We would see that dictum come to life in this case, which contains valuable lessons for all manufacturing managers who contend with the challenges associated with launching new products.

The differences between a smooth startup and a rocky one are significant, and they are almost always driven by managers and their approach to production engineering and planning. When plant managers make prudent decisions with real information and implement proven engineering and management practices, the risks can be minimized and managed.

Startup gone bad

We arrived at the plant about 4:30 p.m. Friday, thinking that most everyone would be gone for the weekend. Strangely enough, we couldn't find one empty space in the huge parking lot adjacent to the plant. We entered the plant to find an enormous amount of chaotic activity in the front office. We were shuffled into a crowded conference room for the production meeting that was already in progress. We soon found out that these meetings were taking place every two hours around the clock to keep everyone abreast of the current state of the nightmare that had been unfolding since the startup began.

After a brief introduction, we discussed the status of the rework inventory, the work-in-process, uptime on three key production areas, and what parts needed to be flown to the customer's assembly plant to keep its line running. There was a hint of panic in the air that signaled serious trouble as the operational numbers were reviewed. Everyone looked exhausted as the bad news rolled over the group. The picture on every front was bleak at best, and the negative numbers told the story of a startup gone extremely wrong. This was threatening the organization's financial well-being and its reputation. The risk of losing the customer loomed very real. As we sat through the stressful 30-minute meeting, the plant manager filled us in on the situation and how this plant had arrived at this dark point. In the words of one front-line production manager, "Anything that could go wrong has already gone wrong at least twice."

This plant was in the sixth week of a six-week ramp up of a new vehicle part launch. The plant was responsible for producing four interior door panels, and production this particular week was scheduled to reach 900 vehicle sets per day (3,600 doors per day). The plant was to deliver door panels on a just-in-time basis (not in sequence, however) to its final assembly customer, with the releases coming 24 hours in advance. The panels were ordered in minimum quantities of a full rack (eight doors). There were 12 part numbers for each rear door and 24 for each front door.

The problem was that production was averaging only 3,000 doors per day — a 20 percent shortfall. The hourly production schedule scramble was designed to ensure the correct mix for that level of parts, shipment, expedite through rework, re-sort in inventory, and compute shortages to determine air shipments. At present they were not hitting any production numbers, and costs were soaring through the roof.

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After the meeting, we spent the next four hours on the production floor observing workflow and asking in-depth questions of all parties concerned. The new product door panels required three major processes. The first was injection molding to make the hard insert of the door panel. The second was a casting process to make the cover, which is what is seen inside the vehicle. The third was marrying these two components and injecting foam between them to give a soft feel inside the vehicle. Each process had unique variables that affected quality, consistency, and overall production performance. In addition, smaller components were injection molded or purchased and assembled to make a completed door panel.

The plant itself was virtually new, with state-of-the-art layout, design, and equipment. The plant was extremely clean. Aisles and the shop floor had been sealed in color code to help with organization. All capital equipment had been purchased specifically for this new product program. Material handling equipment linked all processes directly through assembly to ensure minimal work-in-process. There seemed to be plenty of space remaining in the plant (although temporary storage and rework areas had been set up to help contend with the current crisis). Overall, the plant's physical condition was impressive and appeared to support the operation.

During this crisis, the amount of shop floor labor was extremely high, inefficient, and ineffective in most respects. As the launch performance floundered, the costs of efficiency became less important than simply getting the work done to avoid performance penalties and potentially losing the customer outright. Thus, large quantities of people were thrown into the operation to eliminate production problems and shortfalls (in some cases actually making the problems worse). People were everywhere. In many cases it was difficult to determine what they were actually or supposed to be doing.

Turning around

Our immediate observations and mandate from the plant management team required us to figure out a rapid plan of attack to stop the hemorrhaging of this operation. We suggested that an additional three industrial engineers would be needed to map the current processes from start to finish, determine approximate standards for each operation, and determine current capability at each step of the process in the next 48 hours. This critical step in this plant's turnaround began at 4:00 a.m. Saturday with the ultimate goal of developing a detailed process map that could be

Eight imperatives for LAUNCH SUCCESS

1. Deal with reality: Don't let top management dictate process capability. Plant managers and vice presidents of production do not generally want to hear that a production process is expecting only 85 percent up-time and production loss might be as high as 5 percent to start. But the facts don't change just because management doesn't want to be confronted with reality. Do not let a pressure-ridden process engineer offer rosy processing forecasts — or even standard forecasts — simply because they represent the target. Plan on the appropriate measures of interference during launch and establish targets for improvement through the first six months. Prepare strong documentation for all shop floor operations. Training will ensure that the overall performance of the program during its launch and its lifetime will be greatly enhanced.

Pre-launch question: Have the capabilities of the new processes been proven on the shop floor?

2. Look at all avenues of potential material flow in production design. The flow intensity into a workstation or process includes much more than simply the core product. As a workstation is being designed, it is important to analyze every action in the work cell. This includes the core product coming into the cell, staging and moving the core product out of the work cell, full containers of components coming into the work cell, and staging empty containers out of the work cell. The flow may also include moving empty containers into the work cell for the core product, staging partially filled containers, and multiple storage of finished goods containers for mixed mode production. Beyond the standard flow, the analysis of interferences must be considered, including scrap, rework, maintenance access, and changeovers. Other flows may include quality fixtures and special quality checks.

Pre-launch question: Have all potential alternative flows for each step in the new production system been considered?

3. Make an accurate prediction of the learning curve associated with the startup. Proper documentation and standards are essential to determining the labor requirements for each production operation. However, as the processing options and quality requirements of processes increase, the intellectual requirements of people will also increase. Most shop floor personnel do a tremendous job through initiative and hard work in most startups. This can only carry an employee so far during a new production launch with engineering changes, process designs, and turnover occurring throughout their initial phases of work. A simple estimate of the learning curve required during a launch based on process complexity, effort required, and product variation can help ensure that production requirements are met. Not factoring in a learning curve into a new product launch is an invitation for disaster when history in most startups makes it clear that the human factor plays a significant role in the process.

Pre-launch question: Have production people and supervisors been given adequate time to understand processes and the expectations of the customer before the launch?

4. Get industrial engineers involved early in the design process. The lean manufacturing gurus designed this plant with guidance from the latest readings and training from the world-class manufacturing literature and practices. The management of this program used architects to design the building. They used a reputable engineering firm to design heating and cooling systems, airflow, chilled water systems, electrical distribution, and mechanical support. They used a team of process engineers to specify, select, and purchase equipment. Six full-time tooling engineers worked with several shops and were responsible for the tooling design, build, and launch. Yet the manufacturing systems design was left to the production team. The production team should be involved in all aspects of the facility design, but their responsibility is production. A manufacturing system design team is required to lay out the processes, balance operations, specify inventory according to demand and process variation, determine manning assignments, design material handling systems, determine support requirements, develop monitoring and feedback systems, and design support functions. This system design requires the application of effective industrial engineering principles from the onset. As the manufacturing system becomes increasingly complex, the need for more experienced and professional design input increases. Industrial engineers have the tools and education to design and model this complex and varying production process, and the earlier they get involved the better.

Pre-launch question: Has an industrial engineer signed off on the used to sort out the situation.

This key document would become our scorecard later in the week. This allowed the entire turnaround team to begin to focus on data (instead of opinions or gut feelings) to make critical decisions and develop an overall action plan. The process map identified each step, each flow to and from that step, approximate distribution of each flow, process time and variation, changeover time, staffing, and current productivity at each step. The team identified the cumulative effect of production losses at each step, which revealed that approximately 85 percent of production was not flowing through the entire process without interruption. The initial study also revealed the following key findings about the current situation, which had clearly spun out of control:

• The layout of the facility was designed for one-piece production flow.

• The first-run-through capability was 15 percent.

• All processes were individually capable of 120 percent of the current

production system design and plans?

5. Don't be afraid of designing inventory into the new production system. Inventory, it can be argued, is a waste and a cost to be cut. So are idle equipment, changeover time, labor imbalance, production shortages, stock-outs, and expediting production. Some controlled inventory can be invaluable in a new product startup. "Inventory by design" ensures that the cost impact of these production interferences is minimized. The key here is that the inventory is designed to a minimum level and controlled by a visual system that ensures the maximum level is not exceeded. As these process interferences are improved and eliminated, inventory can be reduced and eliminated. A warehouse of work-in-process is a major barrier to a world-class production process, but a small buffer of components or work-in-process can ensure overall system productivity in a new product launch. Inventory can serve as an insurance policy for smooth flow during the learning curve of a startup.

Pre-launch question: Has the true statistical variance for each process step been considered and is space for a minimal inventory insurance bank available?

6. Don't forget to design indirect labor activities. The indirect labor activities associated with any production process are becoming an increasing portion of the overall production cost. The ineffectiveness of any of these indirect systems has a tremendous effect on the production line's overall productivity. The indirect activities should not be simply allocated to a production area; they should be designed to complete specific tasks, monitor timely performance feedback, and improve measurement and goal setting. These indirect activities include material handling, quality inspection, maintenance, supervision, and process engineering. Each of these functional areas must be aligned with the goals of the production process and each should understand their role and impact on the overall performance. Their performance should be measured and timely feedback provided through similar means as the direct labor functions. It is imperative that these indirect positions be planned, clarified, and set up with value-added thinking prior to any startup.

Pre-launch question: Have standard operating procedures and job instructions for all indirect labor been prepared and reviewed?

7. Design simple and standard operating procedures around people as well as technical processes. Job rotation and job enrichment can fight absenteeism, health risks, boredom, and quality issues. These practices should be implemented by design, not simply assigned to the supervisor by default. During a new product launch, keep the allocations of work in relatively small assignments to allow quick training, easy monitoring of productivity, simple tracking of issues, and simple management for the supervisor. As the processes are proven, the implementation of job rotation and redesign can achieve the benefits without hindering the process or creating a problematic supervisory issue.

Pre-launch question: Are the standard operating procedures for all direct labor activities and all processing functions prepared and understandable to new employees?

8. Design for value-added supervision. The most difficult human job in the production process is front-line supervision. (The only person who could possibly challenge this statement is the plant manager). With that being said, this function can be greatly supported through the manufacturing system design. Detailed job instructions, proper indirect support designs, realistic understanding of true process capability, a clear manufacturing system design, and realistic goals with simple feedback measures will provide front-line supervisors with a starting point for success. Keep the functions they will be held accountable for under their control. Keep the work assignments simple and clearly defined. If front-line supervisors are successful, all the production functions will be successful. Supervisors' jobs must be designed to maximize the value-added activity that best supports and facilitates the performance of the overall production process. Organizations can ill afford to have expensive baby-sitters on the shop floor. In addition, the opportunity to ensure high productivity should include performance measurement and feedback systems. This could be as simple as a public tracking board. Possible meeting areas for one-on-one and team meetings to establish goals, review schedules, check past performance, and analyze collected statistics should be considered.

Pre-launch question: Does the new production design support the requirements and expectations of the production supervisor?

requirements on a daily basis.

- Alternative flows were not accounted for in the production layout, creating tremendous bottlenecks.
- The assembly process was not designed for mixed-mode production.
- There were no standard operating procedures for indirect activities.
- The plant was achieving diminishing returns of productivity in manual processes.
- Staffing on the shop was approximately double what was required for 100 percent standard performance.
- Shop floor employee turnover was running about 10 percent per day for a host of reasons.
- Sixty percent of the shop floor operators and supervisors did not know or were not trained for their assignments.

In the next step of the turnaround, the team of industrial engineers had two critical assignments: They had to determine the primary reasons for lost production at each step of the production process, and they had to determine the short- and long-term design changes required to improve those process steps. Short-term was defined as three days, long-term was three weeks.

The central problem that rapidly emerged from this analysis was that the total production system relied heavily on a tight balance that simply did not exist except on paper. This meant that whenever a process step was blocked due to a quality problem, lack of training, or simple process variation, subsequent operations were stalled and previous operations were blocked. Essentially, a hole in the production chain was created and, by design, could never be filled. The lack of systems balance created a snowball effect in the production process that grew with each additional lost unit of production in each shift. This problem stemmed from assumptions and mandates that were made during the initial design phase of the new production process.

The industrial engineers identified these locations of variation and redesigned the subsequent steps to include small buffers of inventory that could be used to fill production holes immediately. The average process times for these steps were driven down by work simplification and re-staffing each step in the production process. These were simple solutions that could be quickly implemented and had an immediate impact on total throughput. Many of the material handling designs that were established to ensure one-piece flow were redesigned based on the same premise to include small buffers of inventory that could be eliminated at a later date once this crisis had passed and the kinks in the production process were better understood. Line stocking of components was quickly identified as another major source of significant production holes. A simple two-bin replacement system was quickly designed to ensure that there were no line shortages of components and that material handling assignments were simple.

Production supervisors were then assigned to processing zones with clear hourly and daily goals across each shift that were known and communicated to everyone in their work area. This gave supervisors an area of production responsibility that was truly under their control. In addition, shop floor reporting was simplified to a visual system that allowed all supervisors and managers to understand where they were each hour against production goals so that adjustments could be made quickly when problems surfaced.

Managers had to learn to work quickly with a revamped production system. They also had to find ways to get the workforce up-to-speed concerning the required skill levels necessary to meet cycle time demands created by the new process design. After several chaotic days, the short-term changes began to have a profound effect on throughput and cycle time, and production numbers began moving in the right direction. Although the operation was still in an aggressive 24/7 mode, air shipments to the customer were eliminated and daily production requirements were being met.

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Why the mess?

How did this production launch nightmare occur? This was a Fortune 500 company that was well versed in the launch and production of automotive components. But the company committed a number of fundamental errors that resulted in significant negative outcomes. When you cut through the finger pointing, fallout, and broken careers, the primary reason the launch went south from the start was because members of the management team assumed everything was perfectly designed and properly thought out. It was a new plant, with new processes and an energized, experienced leadership team that was applying the latest manufacturing philosophies and practices to capitalize on a significant new customer order that held great potential. What could possibly go wrong?

Unfortunately, three key ingredients required for a successful new production launch were missing:

- The leadership team relied on a production philosophy of lean manufacturing but it did not take the time to determine the potential for production process variation during the launch. This simple variation created tremendous blocking in the production process and shut down required capacity with devastating effect.

• The production people were not properly trained to perform the operations and activities required in the time allotted. Management assumed that the workforce would learn as they performed, which created huge hiccups in the process flow and a great deal of frustration among the operators and their supervisors. Attempts to save training dollars up front created major problems for this plant during the critical startup when people could not perform their jobs as needed to keep pace with production (let alone dealing with unanticipated problems). In addition, employee turnover resulted and compounded all the aforementioned problems.

• Front-line supervisors did not have the experience and were not given the training to comprehend production problems early on. Therefore, they were unable to respond to problems appropriately. Continuous improvement activities during and after the launch could have tightened up the processes and ensured cost effectiveness, but no such mechanisms were proactively created during planning. Management assumed that things were going to go as planned and that contingency planning was a waste of effort and resources. They were guilty of underestimating the complexity of managing new processes, new people, and new problems while over-estimating their abilities to deal with the unforeseen.

Aftermath

The plant manager who was essentially responsible for this startup was terminated at the end of week six of the ramp-up that never ramped up. He found himself spending the next few months working on his résumé and interviewing with several non-automotive companies. The production manager followed a similar career path and found an equivalent position with a competitor. Several other key staff members were short-lived with this company as well. But these were only the individual costs. The short- and long-term reputation of the organization within the automotive industry was greatly damaged. Word of the debacle spread throughout their world operations and among other potential customers. An immediate marketing campaign was waged at great cost to soften the blow.

In addition, future programs were lost to competitors because of this reputation for failure. On the financial side, the corporate controller stressed, "Even with the best-case improvement scenario, over the three remaining years, the program would not facilitate a break-even proposition because of the initial failure." The only reason this facility survived the disaster was that the deep pockets of the corporation allowed it to weather the storm. The company suffered millions of dollars in penalties, air shipment costs, wasted production, and lost future business. By any measurement, this new product was a catastrophe.

The management team was late for this production launch design and the costs were tremendous, both financially and in terms of their reputation in the marketplace. An appropriate investment in engineering the manufacturing system up front would have helped avoid this failure. Even if a launch is smooth, strong engineering of the manufacturing system design by experienced industrial engineering professionals helps ensure efficiency, proper integration with the rest of the plant, true continuous improvement, and long-term profitability.

Don't be late for launch

If you have ever gone through a production launch that is tied to a specific and unforgiving production ramp, you will understand the importance of the lessons learned from this and many similar experiences in both the United States and abroad. Management is faced with the multifaceted task of balancing preproduction costs with the likelihood of post-production success. However, even if the launch is not a high risk, appropriate investment in the professional engineering design of the manufacturing system will provide tremendous returns in productivity immediately at production launch.

Do not underestimate the importance of the human component in the success of any new product launch.

At the same time, do not underestimate the importance of the human component in the success of any new product launch. The success of your career may hang in the balance if you are responsible for a new product launch. In the words of one experienced plant manager, "Launch success is the delicate balance of a good design and the people component coming together with great planning and effective execution ... and giving yourself a margin for error ... without which you might find yourself looking for a new line of work."

For further reading

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