Living up to expectations

By Philip A. Leinbach and Timothy Stansfield

10 complaints your plant manager has about you and what you should do about it

With the growth of flavor-of-the-month productivity improvement programs during the past 20 years, industrial engineering departments have lost respect, authority, and responsibility. The debate about why this has happened could go on forever, but one disturbing perception stands out: Many plant managers believe the primary purpose of the industrial engineering department is to be a training ground for the advancement of new engineering graduates into other functional areas of manufacturing management and support rather than to improve the company's total productivity and competitiveness.

This training ground perception has created conditions that erode the IE department's level of expertise. Combining an understanding of when and how to use the appropriate tools, what is possible, and who is affected in the total picture requires years of leadership and support. Constant turnover of an industrial engineering department due to internal and external advancement leaves an IE culture with no grounding or stability. Opportunities in every functional area of manufacturing — supervision and management, human resources, quality control, process engineering, product management, purchasing, engineering sales — are filled by young industrial engineering graduates who have gotten their taste of manufacturing through a short tour in the industrial engineering department. This often leaves the industrial engineering department and its leadership weak and unmotivated. Weak leadership coupled with brief residency in an IE position guarantees that a new engineer will not receive sufficient guidance to understand all aspects of industrial engineering.

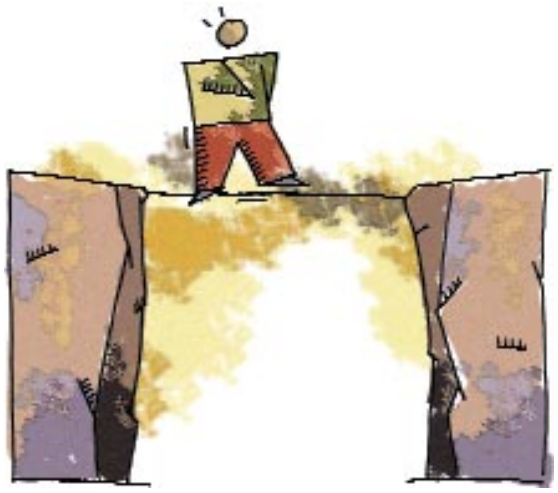
Realizing that industrial engineers in such an environment will perform below their full potential, IE departments have lowered performance expectations for themselves. The modern industrial engineering manager must set the bar for the department's performance at a level that is demanding, challenging, and offers the most value to the total production process. High expectations and accountability will help strengthen the industrial engineer's role throughout the company.

Illustrations by Denise Hadley

In an effort to improve the performance of the typical industrial engineering department, 75 plant managers of varied industries, plant size, and IE department sizes were interviewed to determine the weaknesses of their respective industrial engineering departments. A number of plants did not have titled industrial engineers but may have had a few black belts or lean zealots who have training and leadership authority but little design responsibility or accountability. These plant managers were asked what industrial engineering activities have been traditionally weak and what they would change if they had a magic wand. Most plant managers had one or two activities that particularly bothered them and they gave specific examples of their issues. Following are the top 10 issues, which we believe accurately reflect manufacturing management's view of the modern IE department.

1. IEs are always following the latest trend and do not have a grounded culture for their department.

This was the single biggest issue with the plant managers. One plant manager expressed the sentiments of all when he questioned, "Why do our IEs have to go to seminars to learn basic productivity improvement techniques?"



Without attacking some of the programs that have given value to companies that do not have a significant industrial engineering role, the plant managers specifically mentioned "lite" manufacturing and "Six Stigma" statistical techniques, just to poke fun at a couple. The plant managers' issues with these programs are twofold. First, these programs provide training in basic manufacturing system design, which should have been learned in the industrial engineer's course work. Second, these programs become the cure-all for every manufacturing issue and improvement effort. The marketing efforts driving these flavor-of-the-month programs are tremendous.

One manufacturing plant was driven by a lean manufacturing effort and culture that developed the plant into 50 manufacturing cells centered around 50 injection-molding machines. The plant had a single industrial engineer with a limited amount of experience and was running with the flavor-of-the-month program to improve plantwide productivity. Although the plant had a very low level of work-in-process, two major issues were overlooked. The utilization of this very expensive capital was running in the 60 percent range plantwide, and labor productivity was running at approximately 40 percent based on work sampling studies performed plantwide. These conditions were primarily due to the fact that each injection-molding cell was responsible for running two to six different products throughout the week. The labor content associated with assembly and secondary work varied for each product. Therefore, the staffing for each cell varied day-to-day and even shift-to-shift. The management of these constant personnel changes became a supervisory nightmare. The product-focused cells were the right answer. It just needed to be taken a step further. Family groupings based on labor content and flexible teams based on loading improved labor productivity significantly. Small work-in-process queues for machines with lengthy changeovers greatly improved equipment utilization.

It just took some basic industrial engineering analysis and techniques to save this facility. An engineering discipline can be supplemented with training, but it can't be replaced with a one-week seminar.

2. IEs have been very project oriented and have not looked at the big picture.

One of the strongest statements made by a plant manager during these interviews was that the IE group tends to be territorial and unwilling to look at what is best for the entire plant.

What this plant manager meant is that industrial engineers tend to work

on their given assignments, which will typically apply to a product-focused or functional area of a plant. As the industrial engineer redesigns this area of the production process, he or she tends to strive for the best method, storage, staffing, layout, and scheduling for that area, yet the design may not be the best for the entire facility.

For example, an industrial engineer was assigned to work on the layout, methods, and material flow for a new manufacturing cell that was to provide components to a major automotive manufacturer. There was some open space in the plant so the engineer designed a well-balanced line to fit in that area. The problem was not the design but where it was located. This new cell had relatively low volumes yet was placed directly across from the shipping and receiving area. Other products that were running in the plant had much higher volumes and material handling requirements.

Had the engineer and his manager relocated several other manufacturing cells within the facility instead of taking the path of least resistance, plantwide material handling labor could have been reduced significantly.

Manufacturing redesigns affect all aspects of the production process, so be sure to understand and compute the total effect of change for redesign proposals. Above all, act to improve total value to the customer.

3. IEs do not spend enough time where the action is.

The action is on the shop floor. One plant manager said, "When I want to talk to an IE, I shouldn't be able to just call his or her desk. I should have to page him or her from the floor."

There is no question that design work requires tools such as a computer, desk, and phone that will pull the IE from the floor. But don't create a comfort zone at your desk that prevents you from understanding where value is added. The term "imaginary engineering" was derived from industrial engineers who were reluctant to spend the necessary time on the shop floor to ensure their designs were realistic and implementable.

Try this exercise: Begin each workday by looking at the shop floor. Do cycle checks, observe methods and compare to instructions, work sample for a few hours, look for production variances, suggest two opportunities for improved housekeeping, see if the shift starts on time, and look at the posted reports. While you're doing this, come in a few minutes early and get involved with the third shift. Do this again at the end of your day to look at the second shift.

If this is not the routine of every industrial engineer in your facility, it will be soon by the example you set. You will not only be more in touch with the shop floor activities, but you will be certain to provide better designs and have better implementation success as a result. In addition, the areas of your responsibility will be greatly improved in a short period due to opportunities you identify.

4. IEs have become a report-generating department with massive spreadsheets and models that are too complicated.

"Sometimes I think the IE department gets paid by the pounds of paper generated," remarked one plant manager. This is not good. The simple use of computers and the massive amount of information available allow engineers to model everything in the production process and report on every aspect of its performance.

Information is only of value if decisions can be made from it. Information can actually hurt productivity if it is overwhelming or incorrect. Many of

these models are providing details that management could not possibly interpret or understand. The basic assumptions are so plentiful that it is impossible for anyone to challenge the validity of these models over time.

One of the biggest problems with massive models for capacity planning, standard data, staffing, and other tasks is that these models tend to have a short life cycle because they are difficult to transfer from one person to another. The IE department tends to be filled with talented people who are often attracted to new opportunities for advancement. These models tend to fall by the wayside when personnel changes occur.

List every report that is generated by your industrial engineering department, the frequency of distribution, and the distribution list. Improve the performance of this reporting effort through four suggestions. First, prepare a one-page summary of each report and make that the new distribution format. Estimate the time required to prepare the reports and determine if simplification is possible. Challenge the original assumptions of the models and see if you can improve their usefulness. Second, determine what decisions are supposed to be made from these reports and by whom. Verify that the decision makers are actually using the report to assist them in making their decisions. Third, look at the distribution list and frequency and determine if it is appropriate. Fourth, skip a day of distribution and see who asks for the report. The people who ask should be the only ones who remain on the distribution list. (You might want to get the approval of your supervisor before you try this last suggestion.)

5. The IE department does not get the appropriate buy-in for their designs and proposals.

Some managers would accept a mediocre work cell layout with the supervisor's approval over a perfect cell layout that doesn't have any manufacturing involvement in the design. This may not be advisable, but the point is clear: Design is essential, but so is execution.

A proposal that improves the production process is only good if it can be implemented. Basic human nature dictates that people make sure something works if it's the result of their own design. The industrial engineer's work is centered on changing what others do. To improve the success of these changes, get the end user involved from the beginning. They don't have the engineering background to do your job, but by allowing the person affected to understand the current situation, suggest opportunity for waste elimination, and have input into the redesign, success will be inevitable.

6. IEs spend too much time in personal activities.

IEs should lead by example in the realm of personal productivity, but it is not happening. White-collar productivity is an important issue and opportunity for manufacturing; industrial engineers can lead the way through systematic design, testing, and example. Research has demonstrated that people with goals outperform people without goals.

The IE can design a system of short-term and long-term goal setting with feedback for their daily, weekly, monthly, and annual activities. For example, identify your internal customers and what you do for them. The list of activities may include maintenance tasks, such as updating routers and standards or preparing shop load reports, and change tasks, such as launch support or a special project to improve order-picking productivity. Regardless of the task, most customers want it done faster, cheaper, and better.

Determine how to measure your contribution to the specific activity and track your performance. How much time does it take? How often is

it completed on time? What is its effect on manufacturing productivity, lead-time, inventory, cost, and quality? These activities should be evaluated personally or through your supervisor with quantifiable performance measures. Start small and keep it simple.

7. Proposals for change do not have the engineering detail required to ensure a smooth implementation and long-term success.

"I want to understand where every piece of material will flow under any circumstance, planned or unplanned," stated a plant manager who had specific issues with what he referred to as the optimal-thinking IE who expects that material will flow according to his plan and variations will not happen.

Variations cannot be ruled out; they must be designed out. Sources of variation include processing time, production loss, rework, changeovers, breakdowns, and other potential interference. All these issues offer tremendous opportunities for improvement. Ignoring them or suggesting that the new line will not experience the same issues simply because it's new is naive.

As a new manufacturing system is being designed, understand each issue that can arise and the effect it can have on overall performance. Specifically, develop a process flow sheet that details each process step, staffing, process time, process variation time, and potential interferences such as setup, breakdown, and no operator available. Plant-level value stream maps can clearly communicate system design concepts, but they lack the specifics needed for smooth implementation.

Detailed industrial engineering requires a complete understanding of the process variation that exists so it can be anticipated, accommodated, and, if possible, eliminated through engineering design. For instance, design the queue sizes at each workstation. The target is zero, but queues may be required to absorb process variations. A small queue can absorb a significant amount of process variation and will ensure that a much larger queue is not put in place just to quick-fix a poorly designed work cell.

Also, identify all material flows that could be alternatives to the normal flow. These can include scrap, rework, and engineering samples. After considering and documenting such details, the process flow sheet can now be the basis for your design that covers layout, material handling, manpower, material storage, and methods improvements.

8. IEs have spent tremendous time and effort simulating the obvious.

A plant manager's performance is based on the performance of the plant. The modern platform on which manufacturing competes requires a plant manager who is close to the total production process. Therefore, the plant manager is a technician of the process and will challenge every aspect of change that might affect the total picture of performance. The industrial engineer must use sound engineering principles for redesigns and select the appropriate tools for evaluation.

But industrial engineers are often enamored of technology, and their focus becomes using the technology instead of solving the real problem. Little icons moving around the computer screen are neat but unimpressive, noted

one plant manager. Simulation is often a solution looking for a problem.

Be selective when you decide to use computer simulation to evaluate the results of a new design. Prepare a detailed process flow chart summarizing all variations. Identify which cycle times and variations are known and which ones are estimates. If you have too many estimates, you probably need to work on better system design instead of simulation. Does the process sheet indicate tremendous variation in process steps, process times, product mix, and interference? Are the stochastic variations in the process truly significant? If so, then simulation may be the best tool for analysis and design.

9. IEs get stuck in a routine.

When a plant manager told me that IEs are primarily responsible for standards, routers, and bills-of-material, I don't think he meant it as an insult. But it is. Industrial engineers are trained in all aspects of engineering and are to be held accountable for the improvement of the total production process. Standards and routers are basic building blocks for this improvement process. However, these activities must be carried to a level of significant improvement through goal setting and feedback, production system redesign, and even product redesign.

Ask yourself, What does my job consist of on a daily basis? If you can list a number of activities that are the same day-in and day-out, maybe you are in a routine. You should make time in your schedule to pursue activities that will cause meaningful change in the plant's production processes — the kind of change that improves quality, cost, delivery, and safety performance.

Begin a total value analysis of the biggest product by volume or dollar value and see where it leads you. Quite often, elimination of process steps, reduction in manufacturing support overhead (for example, supervision and maintenance), and product redesigns are the outcome of a total value analysis and revolutionary change in the production process is achieved.

10. IEs do what they are told and not what should be done.

The industrial engineer has the difficult task of dealing with many functional areas of the production process. A new cell design includes manufacturing personnel, supervision, material handlers, safety personnel, materials control, union representation, customer service, quality assurance personnel, human resources, engineering, maintenance, and the list goes on. This is an extensive list of customers for the industrial engineer and all of these customers will have their own agendas.

Industrial engineers are faced with the dubious duty of pleasing everyone with their workstation design, staffing plan, training plan, material control design, capacity plan, contingency plan, and implementation plan. They should be in the best position to lead the redesign effort because their solutions are driven by value to the company rather than self-interest. Change requires strong leadership. The industrial engineer must be sure to follow the basic engineering disciplines for redesign while managing the influences of strong personalities because these influences can make or break a redesign. Keeping these individuals informed with the appropriate level of detail, ensuring that the total value of the redesign is considered, and essentially sticking to your guns, you can be sure the right changes will be implemented.

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What's an IE to do?

There are two ways to view this list: You could be offended and become defensive or you could look for one or two opportunities that can improve your effectiveness and thereby drive the professionalism and respectability of your department to a new level.

What have we learned? There are key ingredients to a strong industrial engineering department: Stick to the engineering basics, lead by example, and take responsibility for the production process design.

The basics of industrial engineering include work measurement and standards, goal setting and feedback, total value analysis, and manufacturing system design. Manufacturing system design, an IE's most valuable contribution, begins with a thorough process flow analysis and continues with a detailed layout, explicit methods, balanced workload, and a strong team effort. Failure to address these basic engineering tasks properly creates unnecessary confusion, cost, and aggravation as people attempt to fix production process design problems on the fly. On the other hand, getting them done right the first time enables a company to reap the benefits of sound planning and concentrate its resources on true continuous improvement.

Leading by example is simple. Challenge yourself and your role in the production process. Keep your eye on the big picture and look for revolutionary change within your planned evolutionary improvement process. Demonstrate your commitment to improving the company's overall performance and others will follow.

An industrial engineering department is strong when industrial engineers accept responsibility for certain aspects of the manufacturing process. Prepare yourselves for this responsibility by being the recognized authority on actual shop performance and conditions. Be close to the action. Spend time on the shop floor. Know what is really happening and why. And then act like the manufacturing system design is your responsibility. Armed with your knowledge of the process, you can be confidently assertive when production design discussions take place. If you are not already responsible for the design, you may be responsible for it soon. Your goal as a department should be to have the responsibility and authority for all manufacturing system design activity.

A quote from the president of a billion-dollar automotive supplier demonstrates the need and desire for the advancement of the industrial engineering department. The executive stated, "We wouldn't build a new building without an architect. We would not design a new component without the design input of a product engineer. Why do we constantly build new manufacturing systems and allow people with a two-week seminar certificate to lead the design effort?" This executive went on to say, "These individuals are so driven by a single concept that critical manufacturing system design issues such as flexibility, learning curves, supervision, total simplicity, asset utilization, and integration into the rest of the plant are not considered. These items will kill the profitability of a major manufacturing plant serving a wide range of customers."

As engineers, we have four or more years of formal education and years of training and experience. We know that a well-rounded industrial engineer with leadership and discipline can provide the necessary expertise in production process design. Let us hold ourselves to a level of professional engineering design that will make companies recognize the industrial engineering department as the best source for manufacturing system design services. Our future is in our own hands.

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