Casting defects handbook pdf

Many people on this side of the ocean have hailed hullabaloo over Japan's miraculous achievements in manufacturing over the past decade with a yawn. So what else is new? They say. Deming said that many years ago. W. Edwards Deming is the godfather, if not the real father, of the performance plants. He was primarily responsible for introducing in the plants the statistical control procedures that the Japanese so deftly took. This article describes Deming's approach to performance and quality: since only management has the power to modify the production system to fix them, product defects are a management responsibility. To change the system, management first needs to distinguish between abnormal and normal changes. It must also promptly indicate what the system should produce. With these controls, the organization can predict performance, costs, and quality, and managers can communicate effectively with customers and people in the shop. And that's the most important thing, because when management sees the system rather than workers as the cause of problems, many of the morally-low outcomes of bad decisions, the goals no one believes, and the motivational slogans that implicitly blame workers for disappearing. John Henry, president of the Global Manufacturing Company, leaned back, sighed and stared at the ceiling. On the table in front of him was a report of two statistics on performance and quality issues at Global's Nightingale factory. Henry and his vice presidents knew it was bad. Customers complained prices were too high, receivables were rising, calls for repairs were rising, costs rose, workers' morale fell, and the union threatened to strike because of management's continued demands for productivity. Also, most of the machines weren't up to work. But they did not trade, Henry thought sadly, about what statistics will find. He took the report, sighed another time, and looked at it again. Your factory in Nightingale, the report says, works day after day sending items, 15% of which (on average) have one or more major defects... This share of major defects in your product may well explain some of your sales and profit problems. The amount of rework your operators have to do along the production line also stifles your profits. Your problems start this way. The operator on the line turns out to be the item. She's looking at him. If she finds a serious defect, she can recycle it herself because she knows that otherwise it may come back to her later to fix it. But, in her opinion, the inspector can not detect this defect. If she does, she can rework it or send it back to the operator. But even if the inspector sees this, the supervisor can intercept on the way back to and send it on through production to avoid getting caught short at a later stage down the line. From the operator's point of view, why not take the chance with both minor and major defects? Send them down the line; most likely they won't come back. From the inspector's point of view, the supervisor can intervene, so fixing the defects can be a waste of time. From the manager's point of view, she may risk a defect. She can't lose and she can get if she keeps her production at a record high. In other words, Mr. Henry, your operator's job is to produce defects. She gets paid for them. This is a system and the operator is not responsible for it. There is management. The point of the memo to the statisticians to poor John Henry is that defects are not free: someone makes defects and gets paid for their manufacture. If a significant part of the workforce corrects defects, the company pays to fix the defects and fix them. If the nightingale plant produces 15% of defective products, then 15% of the total cost is spent on the manufacture of bad units. Obviously, low quality means high cost. All the problems Henry and his vice presidents have stemmed from mismanagement of quality. In other words, and this may be the second point of statistics, the guide achieves a high-quality product by improving the process. If managers can improve the production process, they can transfer resources from defective production to the production of an additional good product. Suppose Nightingale management can improve the process by making some changes at no additional cost, so that only 9% of products are defective. What has the leadership achieved? 1. Productivity has increased. Currently, the plant produces 6% more units at the same price. (If the plant recycles defective, then operators can use the time they have stopped to recycle 6% of defects to make a better product. 2. Aggregated qualities have improved. Now only 9% of the production is defective instead of 15%. 3. Capacity has increased. The plant produces 6% more good units with the same system - labor, machines, materials and so on. 4. The cost of the unit is lower. The plant produces more units at the same price. The price can be reduced. You can see that process control (i.e. good quality management) can alleviate John Henry's problems. With improved quality, customers will stop complaining and returns will drop, sales people will be able to compete effectively because of the higher quality of the product and the lower price, service and repair calls will decrease, receivables will go down (because satisfied customers are more likely to pay bills), costs will go down, productivity will go up, the union will stop threatening to strike, and management will have capital to service equipment equipment Improving this process is key to improving productivity and quality and reducing unit costs. Managers can achieve these goals by understanding the sources of differences in the process and using appropriate operational definitions. Sources of variation Let's look at the manufacturing process that produces steel rods. Although the average diameter of the rods is 2.00 inches, we cannot expect that the diameter of each rod will be just that. We expect some changes depending on how the measurement has been rounded. The variation in the process is natural. In fact, we should all expect this and not be surprised when it happens. But the processes are subject to two sources of variation: normal and abnormal. Abnormal changes are due to a particular or specific cause and may or may not be present during the process. In our example, let's say that we produce a rod with a diameter of 1.96 inches. Is a 0.04-inch discrepancy an abnormal change in the process? Or is it a normal variation that we should expect? If this is an abnormal change, we would intervene and, say, set up the machine. If that's not the case, we shouldn't interfere. In fact, by tweaking the machine for no reason, we would run the risk of throwing the process out of the punch. Some researchers have calculated that abnormal changes cause 15% of problems in the process, while normal changes cause the remaining 85%.1 Normal variations are common to all elements of the process - a whole group of workers, an entire department, and even an entire company, and create most of the high production and maintenance costs and low product problems. Confusion between common and specific causes of differences leads to frustration at all levels, more differences and higher costs. Unable to distinguish between the two sources of variation, management can react by blaming the workers. The worker is powerless to act for the normal reason of change. Employees do not have the authority to sharpen definitions and tests that determine acceptable quality. They can't do much about the machines or the testing equipment that's out of order. They can report such events, but management must follow up and make the necessary changes. Workers also cannot change the specifications and procurement policies of incoming materials, nor are they responsible for the design of the product. They are all part of the system and only managers can change the system. It is hard to overstate how high morale will be at most factories if management is only responsible for what they can control, not for the system's shortcomings. What is this variation? Since workers cannot be held responsible for the system, managers must be able to distinguish between abnormal and normal changes so they know and how to change the process. The only safe way to differentiate the two sources of change in the process is to that generate control charts. The Control Chart System Control Chart has a central line that represents the average process value, and two control limits, top and bottom. Suppose you want to study a key processing operation in the data processing department. First, according to statistical theory, you determine the sample size of, say, 200 cards per day.2 Then you take random samples of 200 cards from each day of output and check them for errors. Exhibition I shows how to build a control chart for keyboard operation. Exhibit I Formula Graphics Control for Keypunch Operations Note: Both points (day 8 and day 22) that lie above UCL send a statistical signal for management to search for possible sources of abnormal changes on day 8 and day 22. The Ia exhibition shows the percentage of keypunch cards that are defective. The Ib exhibition is a plot percentage of defective (column 4 in Ia) vs. Day (column 1 in Ia). The Ic exhibition shows the calculations you need to build a central line (in this example the average percentage is defective to the process) and the upper and lower control limits. You build a control chart (Exhibit Id) by connecting the points built in Ib, and drawing the central line and the upper and lower control limits through the dots. Finally, you analyze the management chart. If the sample value falls into the upper and lower control limits, and if the trend or any other systematic model is absent, the change is probably normal. However, if the sample value falls out of control, the change is probably abnormal. The diagram shown in Exhibition I is just one of many types of control cards, each of which has a special purpose. (You can find examples of other charts in the sources listed at the end of the article.) If the variation is abnormal, comparing Ib and I'd the reader will see how difficult it is to distinguish between the two causes of the change with the naked eye. The Ib exhibition does not allow managers to distinguish between two sources of variation, while Exhibit Id clearly shows that in the days 8 and 22 something abnormal happened, not related to the system to cause defective cards to be keypunched. When a manager determines that the cause of the change is abnormal, it must look for and address the causes that are related to a particular employee or group of workers, the machine, a new batch of raw materials, and so on. Once management eliminates all the assigned causes of variations, it remains with a stable process that is in statistical control. Let's revisit the keypunching operation shown in the I exhibition in more detail. Look at the control chart for the percentage of error cards (Id). Typically, control restrictions are based on a multiple standard error. Usually it's a few 3 and the limits 3-sigma limits. This means that there is about the odds of 1000 that the location of the point outside the limits is due to a natural random change in the system. If we look at the diagrams in exhibits I and II, we see that the two points are beyond the upper limit of control, indicating that the process is not in statistical control. Exhibit II Control Charts for Keypunchers What Should Be the Next Guide Step? In order to bring the process under control, management should examine the points that have been out of control in order to eliminate the assigned causes of changes in the process. Suppose the manual found that a new keyboard operator had been added to the workforce on the 8th day, and that one day the employee had to acclimatize to the new environment, probably causing an unusually large number of keyboard errors. To ensure that this assigned cause does not happen again, the company has established a one-day training program. The investigation of the 22nd day showed that the previous evening the department had run out of cards from the usual supplier, and he did not expect a new shipment until the morning of the 23rd day. Consequently, the department purchased one day of card delivery from a new supplier. Management found that these cards were of poor quality, leading to a large number of keyboard errors. To correct this designated variation, management introduced a revised cadastral policy and promptly determined the acceptable quality of keypunch cards. By eliminating the days during which the assigned causes of variations were found, managers recompated the statistics of the control chart: Exhibition IIb shows a revised management chart (IIa shows the original chart). This process is currently stable in the field of statistical control. A stable process that manifests only variations due to inherent systemic limitations allows the manager to determine his capabilities, that is, what is normal. Here are some of the benefits of achieving a stable process: 1. Management knows the possibilities of the process and can predict its performance, costs, and quality. Under the current system, productivity is maximized and costs are minimal. The guide can measure the impact of changes in the system with greater speed and reliability. 4. If the management wants to change the specification limits, it has the data to back up its argument. The possibilities of the process become a given. A stable process that leads to an unacceptable number of defects will continue as long as the system, as defined at present, remains the same. And only management is responsible for changing the system. Normal Changes Once the process achieves stability, which is not a natural state, but an achievement, management is willing to act on the system to improve performance and quality. can improve the system by: 1. Shift of the average process. For example, management may want to reduce the percentage of defects or increase average output. 2. Changing the amount of the amount Variations. Given the economic demands of the market, management may want to reduce the number of variations to get a more consistently single product or increase it to get a less single product. Some inputs and procedures, such as labor, training, supervision, raw materials, machines and operational definitions, define the system. To improve the system, management must change these factors. Again, we stress that only leadership has the responsibility and authority to make these changes. Workers alone cannot influence the system. How can management give the decision to change the keyboard process to improve performance and quality? By introducing exercise procedures that reduce the average percentage of defective cards and the number of overall changes (resulting in narrower control limits), management can help employees produce more unmistakable cards consistently. The IIc exhibition shows a new management scheme after management introduced training and procedural changes. The average percentage of cards with errors decreased from 0.017 to 0.008, and the variation of the process decreased. It is important to emphasize that the concepts we have discussed do not only cover control charts. Companies can use control charts without any understanding of the approach that we care about, namely management's responsibility for improving the system, the lack of the usual dependence on final verification, the removal of slogans, the elimination of arbitrary standards of work, and so on. We're here full circle. We know that improving the process improves productivity and quality. By distinguishing between abnormal and normal differences and eliminating anomalous differences, managers can gain statistical control. But this is not enough to improve productivity and quality. If management fully understands the sources of variations and sees that its responsibility lies in improving the process but does not understand operational definitions, its efforts will continue to be in vain. What is being done? If management can't pinpoint its products, how can it sell them, describe what it wants for the people on the shop floor, or improve the production process? He can't. Without a prompt definition, people cannot do business. Here's an example of the confusion that a lack of an accurate idea of what's being produced can result: The label on the blanket reads '50% wool'. What does that mean? Half the wool, on average, over this blanket, or half the wool per month of production? What is half a wool? Half the weight? If so, at what humidity? What is the method of chemical analysis? How many tests? Is the bottom half of the wool blankets and the top half something different? Is it 50% wool? Does 50 per cent wool mean that in any random sing should have some kind of wool Half a dollar? If so, how many cuts Be tested? How do you choose them? What criterion should correspond to the average? And how many differences between cuts are permissible? Obviously, 50% of wool can only be specified in a statistical plan. 3 What is the exact or true definition of the term? For example, what exactly is round? There is no single definition that will help us determine if something is actually round. The dictionary won't help either. Webster says that the shape is round if it has every part of the surface or circumference equivalent from the center. This definition is very useful for formal logic, but if we try to use it to determine if our drive is round, we will have insurmountable difficulties. The dictionary contains a concept, not a definition for use in industry. How, then, can we define a term that is understandable at the store level? Operating definitions have two types: one for attributes, such as success versus failure, and one for variables, such as sales. The operational definition of an attribute consists of: 1. Criterion, which will be applied to an object or group. The procedure for selecting the object being studied. 3. An operation, such as measuring or monitoring an object. 4. Record the result. Check the object to see if it meets the criteria. The decision is yes or no as to whether the object meets the criteria. To get a quick definition of the variable, managers will take the same first four steps as they would to determine the attribute. (Steps 5 and 6 for attributes do not apply to variables.) The question now is, what is the significance of operational definitions for a company's performance? We know how important it is for manufacturers and users to understand each other. Without operational definitions, the specification does not make sense. Conflict and confusion between companies and between departments in the company arise due to the inability of managers to advance, in meaningful terms, specifications for the item or its performance. Think about the performance and quality of the problems that can occur when an inspector who is responsible for finding defects is incompatible over time in its judgments, or when inspectors are incompatible with each other. Workers don't know what's acceptable and what's not acceptable. They need to quickly identify a defective product. Let's say we make round discs. Drives round? Why do we care? If the drive is too far away from the round, it will jam the customer's machine, cause damage to the equipment, and lead to downtime. If we want to stay in business, we have better care. Let's write down the operational definition of the round for the drive. Since we measure the attribute (round versus not round), we will work on the first type of operational definition. Step 1: First we want to get a criterion for the object. a. Use wicketkeepers, are in good enough good (You immediately perceive the need to question every word.) What is a reasonably good order? (We'll settle the issue by allowing you to use your calipers.) But how should I use them? We will be satisfied if you just use them as usual. At what temperature? The temperature is in this room. b. Take 6 measures of diameter about 30 degrees apart. They record the results. But what is about 30 degrees apart? Don't you mean exactly 30 degrees? No, there's no such thing as exactly 30 degrees in the physical world. So try 30 degrees; We will be satisfied. c. If the range between 6 diameters does not exceed 0.007 centimeters, we will announce the disc round. We have defined the criterion. Step 2: Let's choose a certain disk. (We could at this point specify some sampling schemes.) Steps 3 and 4: Prepare measurements and missch results in centimeters - 3,365, 3,363, 3,368, 3,366, 3,366 and 3,369. Step 5: Range from 3,369 to 3,363, or a difference of 0.006. We test for compliance by comparing the 0.006 range with a criterion range of less than or 0.007 (step 1). Step 6: Since the disk passed the prescribed rounding test, we declare it round. If the company has employees who understand what is round, and a customer who agrees, the problems that the company may have had satisfying the customer will disappear. Consider another example where operational definitions improve understanding within a company. In this example, we measure the variable (sales), so we use the second type of operational definition. The retailer is told its performance will be measured against the share of changes in sales this year relative to last year's sales. What does that mean? Average percentage change each month? Every week? Every day? For each product? Percentage change between December 31, 1980 to December 31, 1981 sales? How do we measure sales: gross, net, gross profit, net profit, and so on? Is the percentage change in permanent or inflated dollars? If it is in constant dollars, what is the base year? If it's in inflated dollars, is it at last year's prices or this year's prices? In what economic conditions? The free definition of percentage changes can only lead to confusion, frustration, and ill will between management and sales, which is hardly a way to improve productivity. How should management quickly determine the percentage change in sales? Step 1: Percentage change in sales is the difference between 1981 (January 1, 1981 to December 31, 1981) Sales and 1980 (January 1, 1980 to December 31, 1980) sales divided into 1980 sales: S80 measured in constant dollars, from 1979 as a base year, using June 15, 1979 and June 15, 1980 prices for the receipt of constant dollar prices and . unit sales are less than profit (for any reason) as December 31, 1980 for each product. The S81 is measured in constant dollars, from 1979 as the base year, using June 15, 1979 and June 15, 1981 prices to produce constant prices in dollars, and total unit sales less profit (for any reason) as of December 31, 1981 for each product. (Pi79 remains the same for all products.) This procedure for calculating the percentage change in sales between 1980 and 1981 will be valid regardless of economic conditions. In addition, management may review the definition of a percentage change in sales after the 1985 sales estimate, but not sooner, unless the sales and sales management department agrees. Step 2: The seller and her sales records are the subject being studied. Steps 3 and 4: The Sales Manager will use all invoices from 1980 and 1981 and return receipts to calculate the net number of units sold for each product in 1980 and 1981. The sales manager will record the calculations and results. The previous definition of sales may not be appropriate for another manager and sales department; however, if the sales manager accepts it and the sales team understands this, that's an operational definition. Operational definitions are not trivial. If management does not identify many critical variables and attributes, employees as well as customers agree, serious problems will follow. The management scheme becomes a useless management tool because of a whole new source of variation: measurement changes. Management is responsible for quickly identifying the characteristics that have been outlined. If the inspectors do not agree with each other, or with themselves day in and day out, chaos will develop. Workers don't know what's expected of them. Their output is in order for Inspector 1, not For Inspector 2; The work of the employee may have been accepted by Inspector 1 yesterday, but may not be today. The number of top management employees recently wrote guidelines that tell management what it needs to do to improve productivity: Create an institution that has a permanent goal and long-term, senior management commitment. Break down the barriers between departments. Create an environment where people aren't afraid to report problems. Disarm built-in levels of defects, bugs, bad materials, and so on. Don't blame workers for productivity and quality issues. The reader is undoubtedly familiar with them. Additional governance guidelines, which may not be as obvious, follow, however, from the approach we have outlined here. 1. Don't expect the inspection to solve the quality problem. By the time the test is done, the product is already acceptable or defective. You can't check the quality in the product. Mass inspection does not separate good objects from bad ones. The best way is to small product samples for control charts to achieve or maintain statistical control. In this way, managers can eliminate the need for and use the talents of inspectors for other purposes. Sellers and customers could also compare their tools and tests; sellers and customers can start speaking the same language. Inspection under pressure is often a farce: whether it goes or goes, something passes. And since shared responsibility means that no one is responsible, 200% verification is less reliable than 100% verification. 2. As part of the policy, stop awarding business to the lowest bidder. Without measuring the quality purchased, the price makes no sense. Purchasing managers need education and experience in assessing quality statistics to assess quality. If buyers become experts in quality assessment, most of them will drastically reduce the number of suppliers they deal with. A supplier that does not know its costs or whether it can replicate today's quality distribution tomorrow is not a good business partner. 3. Eliminating targets, numerical targets, slogans (zero defects), photos and posters that executives so often plaster in factories urging people to increase productivity. Unfortunately, such productivity programs leave defects where they are. They do not identify or correct system flaws, and they do not provide a statistical signal managers need to take corrective action. They don't answer the critical question: How can we improve productivity? Elimination of work quotas. Work quotas do not take into account normal changes in the system. They do not include a way to identify the need for corrective action or a way to place responsibility on the leadership or on the delegate leadership on the line. For example, a bank manager can determine the number of customers an employee has to handle within an hour, the amount of interest calculations and penalties someone has to calculate within an hour, and a similar figure for any other activity. However, standards say nothing about the quality of the job or give the manager any way to understand the differences in the process. The standards do not specify what actions managers should take or how to improve the process. 5. Statistical training programmes so that managers and managers can understand how to manage quality. Surveillance is part of the system and, of course, is the responsibility of management. Statistical methods are vital tools for professionals and production managers to identify the causes of waste, poor productivity and poor quality. Managers can also use them to determine when staff are fully trained and when further training will help. Committee E-11 of the American Society for Testing and Materials Control Guide (Special Technical Publication 15C, 1951) and the American Society for Testing and Materials Guide to Data Presentation and Analysis of Management Schedules (Special Technical Publication No. 15D, 1976). 1976). W. Burr Engineering Statistics and Quality Control (New York: McGraw-Hill, 1953). Acheson J. Duncan quality control and industrial statistics 4th Ed. (Homewood, Ill.: Richard D. Irwin, 1974). David Durand Stable Chaos (New York: General Learning Corporation, 1971). A.W. Feigenbaum Quality Control (New York: McGraw Hill, 1951) and Total quality control: Engineering and Management (New York: McGraw Hill, 1961). Eugene L. Grant Statistical quality control (New York: McGraw-Hill, 1946, 1952, 1964, 1972). Later times courtesy of Eugene L. Grant and Richard S. Leavenworth. Kaoru Ishikawa's quality control guide (Tokyo: Asian Productivity Organization, 1976). Joseph M. Juran's quality control handbook, 3rd Ed. (New York: McGraw Hill, 1974). Harry H. Ku et al. Special Publication of the National Bureau of Standards No. 300 (Washington, D.C.: U.S. State Printing House, 1969). E. H. Mac Niece Industrial Specifications 3rd Ed. (New York: John Wylie, 1953). Ellis R. Ert Process Control (New York: McGraw-Hill, 1975). Walter A. Howhart Economic Product Control (New York: Van Nostrand, 1931; American Society for quality control, 1980). Leslie E. Simon's Guide to Statistical Methods (New York: John Wylie, 1941). These guidelines specify what top management should do to improve productivity and quality. While following each of the guidelines will not produce tangible results, at the same time, the company that starts today is fully committed to soon realize impressive success. A close second for quick results would be to banish fear to help people feel safe, and to help people get over the fear of reporting problems with equipment or with incoming materials. Managers can achieve this goal within two to three years and reap strong economic results. 1. See, for example, Joseph M. Juran, Guide to quality control, 3d ed. (New York: McGraw-Hill, 1974). 2. Discussions on how to calculate sample size can be found in numerous texts, some of which we have listed at the end of the article. 3. W. Edwards Deming, quality, performance and economic situation (Cambridge: M.I.T. Center for Advanced Mechanical Engineering, 1982). A version of this article appeared in the September 1983 issue of Harvard Business Review. Reviews. casting defects handbook iron & steel. casting defects handbook copper & copper-base alloys. casting defects handbook copper & copper-base alloys pdf. casting defects handbook iron steel pdf. casting defects handbook download. casting defects handbook aluminum and aluminum alloys. afs casting defects handbook pdf. afs casting defects handbook