Medica Scientific

[1]

The financial information for the last 50 days is disheartening. The results are getting worse. I don't know if we can reverse the trend.

Thus, spoke one of the members of the newly hired management team while reviewing data from the MS-1 plant of Medica Scientific. Another team member added:

The situation is complex. The data is confusing. There are detailed figures, but it's necessary to develop an information system to monitor plant performance. We have to start right away if we want to see results before the end of the year.

Background:

The concern Medica Scientific (MS) used cutting-edge technology and new materials to make devices that were used in minimally invasive surgical procedures. With these devices, doctors could - either through natural anatomical openings or small incisions - operate, observe, implant, or medicate their patients. MS produced devices for ablation, diagnosis, embolization, and implants of many types for the vascular, gastrointestinal and pulmonary systems. Each product was manufactured in a dedicated plant, as the technology required that it be coupled to a very specific process. Changes in materials, in medical technology, in computer science, and in-process technology forced the frequent updating of products and manufacturing plants.

The MS-1 plant:

Medica Scientific's MS-1 plant was an independent operation within the conglomerate. The MS-1 manufactured medical devices designed to be placed inside the human body and remain there for a long time, both to correct pathologies and to release medications in a controlled manner. A typical example of

[1] This case has been written by Processim Labs to be used solely as a basis for class discussion and not as an endorsement, a source of primary data, or an illustration of effective or ineffective managerial actions. The case, although based on real events, has been fictionalized, and any resemblance to actual people, firms, or other entities is entirely coincidental. This case is the property of Processim Labs and all rights are reserved. The case cannot be copied, digitized, photocopied, saved in digital media, or otherwise reproduced, posted, or transmitted, without the permission of Processim Labs. All rights to these documents are reserved by Processim Labs.

this type of implant, although not necessarily identical to that manufactured in MS-1, was the stent. Stents were reticulated tubes made of inert metals that were used in coronary angioplasty operations as reinforcements of narrow or weak arteries.

The devices manufactured in MS-1 were used in patients whose condition was neither critical nor the product of pathologies that manifested unexpectedly. Therefore, the vast majority of devices were used in elective surgical procedures planned in advance.

The MS-1 had been operational for several years. Its manufacturing technology would soon be supplanted by a new technique that used new-generation materials. These new materials could not be processed currently in the MS-1 and the plant would be shut down within about a year. Some equipment would be transferred to other plants. Any remaining inventory would be considered worthless, and it would be discarded.

MS-1 Business Lines

The MS-1 had two manufacturing lines. The *Standard line* produced regular devices for the general market. These devices were manufactured to stock, they were generic and they shipped with enough material for users to make some brief personalization at the place of use. The market for standard products was dominated by purchasing departments of large health institutions, and it was very competitive. The demand for standardized devices was much higher than the production capacity of the MS-1, and it depended on the price that the company set with respect to the market price.

Executives who had administered Medica Scientific in the past year had kept prices below the market average. The president of the Board of Directors had said that executives "must have had their reasons to keep prices like this." There was no information on quantity demanded at every possible price.

The second production line, the *Custom line*, made customized medical devices. This customization was consistent with a recent trend that sought to integrate the process from the medical imaging to the fabrication of the device so that the implant was configured to fit the anatomical conformations of a specific patient. Typically, implants were ordered by hospital purchasing departments, which consolidated requests and sent an order to MS. The devices were made with materials identical to those of the Standard line, but the process was different since customized orders included the information required to make the personalization of the device. Such customization was not possible for all patients, which is why the two production lines existed in parallel[2]. Since the implants manufactured by Medica Scientific served as vehicles for the controlled delivery of drugs, orders were specified according to the amount of medication required by each patient.

Customers of the customized product line valued precision, so that the manufactured device complied with patient's specifications, and, above all, valued delivery speed since once the doctor and the patient agreed to carry out the medical procedure, they reserved space in a surgical room for a specific date. The price that

[2] This was due to a number of reasons, such as the difficulty in specifying the personalization parameters of the device due to the difficulty in obtaining good medical images, because anatomical conditions, because of budget difficulties in medical centers that prevented them from acquiring or using the equipment necessary to generate the complex information required to develop the custom device, among others.

the company could obtain in this market depended upon past delivery time performance: if the delivery time was long, the company obtained lower prices. Likewise, if the company stopped producing, firm reputation suffered and customers were not willing to pay high prices to a company whose presence in the market was uncertain.

The Custom line received orders with variable magnitudes and arrival times[3]. Due to space constraints, the Custom line rejected orders when there were more than 360 jobs in process.

Operations

Raw Material Inventory Management

Medica Scientific's devices were made from generic sets of materials, called "parts", which were supplied by a reliable, near-by supplier. The company handled its raw material inventory with a continuous review system. Under this system, an amount was requested each time the inventory level reached the reorder point. Management determined the reorder point and quantity. The supplier took 4 days to fulfill the order. If there was not enough cash to cover the cost of the parts of raw material requested, the order was not executed. Each part of raw material costs $50 and each order had a fixed fee of $1000, regardless of order size.

Once in the raw material warehouse, the inventory was assigned to the production lines as needed. If the available amount of parts was less than the total of parts requested by both lines, the Standard line was supplied first and the remainder was assigned to the Custom line. The Custom line required 1 parts of raw material per unit. The Standard line required 2 parts of raw material per unit. In both lines, accepted orders were not passed to production if the required inventory was unavailable, instead, they remained as accumulated orders until enough inventory was available.

Flow and Operations

Refer to Exhibit 1, which shows a diagram of the MS-1 process.

Custom Line

The first part of the process called MCE (Molding, Cutting and Electro-polishing) was common for the Standard and Custom lines. There, metal grids of stainless steel, titanium or chromium, and cobalt alloys were molded and cut. This station also had a process of heat treatment and an electro-polishing operation. Machined and processed devices were sent to the Custom line or the Standard line. The managers decided, on a daily basis, to which of the two lines devote the available capacity of this first workstation. For example, if managers decided to dedicate 50% of this station's capacity to process standard items, then 50% of the available time would be used for those products.

[3] Forecast based on previous periods indicated that the demand was expected to remain stable until day 172, increase until day 218, remain stable until day 400 and remain stable after that.

In the Custom line, the raw material was adjusted to have the shape required by the patient's anatomy. This was done with computerized whittling and micro abrasion (WMA) processes. The semi-finished devices were then taken to a "passivation" station and finally went to an ultrasonic cleaning procedure[4] (PUC: Passivation and Ultrasonic Cleaning). The same device went through the forming machine again for a few final changes before going to the customer. The ultrasonic cleaning machine allowed tolerances to be reviewed according to specifications and according to the amount of medication that each order needed.

Standard Line

Since the Standard line manufactured to stock, it was necessary to determine the frequency and size of shipments of production orders to the floor. This decision considered expected demand and production capacities. Each production order had an associated fixed fee of $100, regardless of its size. Currently, weekly batches of 60 units were being sent. In the Standard line, there were no limitations to the quantity of product in process.

Once the parts were available in the raw material inventory, units entered the molding, cutting and electro-polishing operation. It was common to see accumulations of standard units waiting to be processed in MCE. In MCE, the units were individually processed before moving to temporary storage where they waited to go on to the manual assembly, revision, cleaning and packing (ARCP) operation. In that area, units were grouped in batches. This grouping was necessary because the regulation required traceability and integrity. Management determined the production lot size, which now was equal to 60 units. Batching was carried out on an automatic machine. The batching machine required, regardless of batch size, a 4-day preparation and adjustment time.

Once grouped and identified, batches were sent to the assembly, overhaul, cleaning and packing station. The information system assigned information to the batch record[5]. At this station, the manual processes were performed by highly qualified personnel. They reviewed the products using amplification equipment and sophisticated video inspection gear, tolerance review software and high-resolution microscopes. In that, same manual station there was an ultrasonic cleaning process and a packaging process.

After the manual process, the batches entered a clean room, and after a review and cleaning, each unit was vacuum-packed in sterile bags. Thereafter, new batches were assembled and sent to the finished product inventory warehouse by conveyor belt[6]. The size of these new batches is independent of the batch size at the previous batching station but at the moment management has kept it at 12. It was feasible to sell fractions of production batches, but the batch data to which each device belonged was always preserved. The sale was from inventory and on the spot market.

Machinery and Equipment

[4] Passivation consists of incorporating thin layers of certain materials on metal surfaces to protect it from the action of external elements and to prevent the occurrence of reactions such as corrosion.
[5] This record indicated, among other things, the lot number, the total units in the lot, and the start and finish times of the processes.
[6] The warehouse was a semi-clean room, standard ISO 4, in which the product entered after passing through a sterilization system.

The machines were sold by a nearby manufacturer. Each molding, cutting and electro-polishing equipment -at the first processing station- cost $20000. Sharpening and micro abrasion equipment, of the second process in the Custom line, cost $15000 each; and each passivation and ultrasonic cleaning machine, used in the third process, was worth $12000. The equipment manufacturer delivered immediately upon cash payment. In the past, management had ordered equipment that had been held back for lack of cash. Currently, each workstation had a machine. It was feasible to sell machines as long as there was at least one in the corresponding workstation. The selling price of the machines was equal to $10000, $7500 and $4000 for MCE, WMA and PUC stations respectively.

Work Force

People hired for the Standard line Manual Station were typically graduates of a nearby university or people who had worked in related industries. All new staff went through a 15-day training period.

The productivity of a new employee, regardless of previous experience, was estimated to be equivalent to 40% of the productivity of an experienced employee. Approximately, an expert could process 3 unit(s)/day in the manual station of the Standard line, but skill and productivity could vary among operators, and over time. Right now, the station had 1 people, all experts.

Management could lay off experienced staff, but, due to legal considerations, it was impossible to dismiss new staff in training. The daily workday was an 8-hour shift. Management could extend the working day and add shifts or fractions of shifts, implying that the same people would work longer. Overtime was 50% more expensive than regular time. Wages were $85 per day for newbies and $150 per day for the experienced. Occasionally some employees quit. This was common if they became fatigued due to working long hours.

Financial Issues

The company had two credit lines. The regular credit line allowed loans that were available for immediate use. The cost of regular debt was equal to 36.5% per year (prorated per day). Each disbursement incurred a commission of 2% of the loan amount. The second line was an automatic advance to pay wages when there was not enough cash. Although the company paid monthly wages, such payments were, for accounting purposes, prorated on a daily basis. The automatic advance would incur a commission of 5% on the amount. For example, if $100 were provided, then the bank would add $105 to the amount owed on the regular credit line. Management could request or pay off debt at any time.
The company wanted to maximize cash "on hand", that is, available cash net of debt. Money invested in inventory of any kind was not considered within the cash on hand calculation. Cash on hand generated interest of 0.05% per day.

The Dilemma

Last year MS-1 had performed poorly. The Board had given managers an ultimatum, but the situation had worsened and the level of cash available had declined. As a result, the Board of Directors had fired them and had hired a group of people to manage the plant. The president of the Board of Directors had thus expressed to the writer of this case the feeling of the Board:

Our mission focuses on the well-being of patients. If we have to reject orders or if we do not sell everything, we could have sold, we would not be providing good service to people who need our devices to improve their quality of life. But we also have shareholders to respond to. Our plants are projected based on cash flow estimates in order to obtain a return on investment. When we build a plant, we already know that the technologies will change. That's why we plan our operations to run for a limited time. In this case, the MS-1 will only operate for one more year and we need its performance in the last year to improve.

The same chairperson of the board had justified the decision to fire previous managers as follows:

The Board of Directors has always given managers the freedom to make whatever decisions they deem appropriate. We focus on global indicators. The financial deterioration forced us to review the policies of the previous management team and, frankly, we did not understand half of them. We decided that it would be better to appoint a new management team to manage what is left of this plant's life.

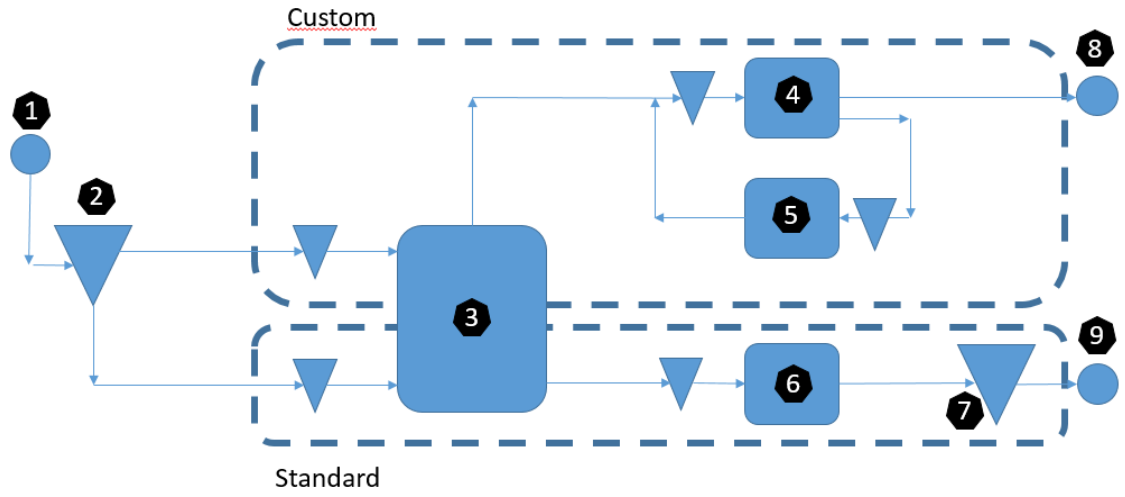
For Medica Scientific cash management was vital to finance new facilities that would supplant previous technologies. A cash deficit in one operation created a cash flow hole and eroded the process of strategic planning and technological succession. The MS-1 should generate as much cash as possible.

The new management team was now studying the MS-1 information and discussing possible actions. They had compiled a database (refer to accompanying Excel file) with information on flows and part accumulation in the Custom line and the Standard line for the last 50 days. They also had information about the level of raw material inventory. The great amount of information and the complexity of the problem had caused some perplexity in the new management team. They knew that the Board of Directors was going to judge their performance against the cash level. A director had told them:

Look at the beginning of the year, the amount of cash we had. One would expect that at the end of the period we will have substantially more than that. Otherwise, your management during this final year would not make much sense and hiring you would have been in vain.

Those words still buzzed in the heads of the team members. They had bet their reputation by coming to this company. At first, it had seemed like a routine job, but that was not so clear now. The time had come when the team had to propose guidelines and policies. What were the alternatives available? Where to target the efforts? Time was pressing. The team had to devise a strategy and get to work immediately.

Exhibit 1: MS-1 Process Flow Diagram



x	Process item despcription
1	Arrival of raw material inventory
2	Raw material inventory
3	MCE: Molding, cutting and electropolishing
4	WMA: Whittling and micro abrasion.
5	PUC: Passivation and ultrasonic cleaning
6	ARCP: assembly, revision, cleaning and packaging (ARCP). Operation with large manual component.
7	Finished goods inventory, standard line
8	Delivery to customers, custom line
9	Delivery to customers, standard line