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# The Feasibility of a Just-In-Time Inventory in a Job-Shop Environment

by

Kyle H. McDonald

An Applied Management Decision Report
submitted in partial fulfillment
of the requirements for the degree of
Master of Business Administration
Cardinal Stritch College
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APPROVAL PAGE

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# CASE SUMMARY

The Oscar Mayer Machine Assembly and Parts Supply Assembly Inventory has been experiencing a great increase in holding value in the past years. No more resources are to be allotted to this inventory and the continued increase in holding value creates a situation of dead capital unable to be used elsewhere and unable to be depreciated. This inventory must be reduced and the feasibility of implementing a just-in-time inventory in order to accomplish this is the focus of the paper.

The literature indicates that a full JIT implementation is impossible because of the custom engineering manufacturing environment of the inventory. Other more practical considerations such as inventory bloat and long lead times make staying with the present system just as unacceptable. Based on the parts usage and parts repeatability data and the aggregate inventory data, the recommendation is to accept and implement a partial JIT system including the principles of vendor relations, supplier certification, and employee involvement.

# TABLE OF CONTENTS

## LIST OF TABLES

# LIST OF FIGURES

# SECTION I

# INTRODUCTION

Oscar Mayer Foods Corporation is an international meat processor with its national headquarters in Madison, Wisconsin. Oscar Mayer began as a single, independent company but through the years has purchased a number of businesses and has itself been purchased. The company now owns and operates Louis Rich, Louis Kemp Seafood, and Claussen Pickle. Under Oscar Mayer direction and production are such products as Oscar Mayer Wieners, Lunchables, Zappetites, and Bologna, Louis Rich Breast of Turkey, Turkey Hot Dogs, and Turkey Bacon, Louis Kemp surimi products including Sea Lunchers and imitation crab and, of course, Claussen's pickles. Oscar Mayer itself was purchased some years ago by General Foods, which in turn was purchased by Philip Morris. After the Kraft Foods acquisition by Philip Morris, Kraft General Foods was created and Oscar Mayer now operates under their direction.

Oscar Mayer and Louis Rich are unusual in that they design and build in-house a great portion of the machinery involved in the production of their product. To differing degrees, most companies would contract out for the design, engineering, production, installation, and often maintenance and modernization of their production equipment. Oscar Mayer's continued use of this function carries a great many advantages, such as the ability to respond rapidly to meet new product needs and an inside knowledge and expertise of production requirements. However, such a giant undertaking as equipping all the plants in the United States (namely, Kirksville and Columbia, MO, Chicago, IL, Davenport, IA, Los Angeles, Fullerton, and Tulare, CA, Madison, WI, Nashville, TN, Philadelphia, PA, Sandusky, OH, and Sherman TX) with custom made machinery also carries disadvantages.

The inventory which is the subject of this paper is the Oscar Mayer Machine Assembly and Parts Supply Assembly Inventory (MAPS). This inventory holds fabricated and off-the-shelf machine parts that are used in the production of these many and varied machines. This inventory is a work-in-process type in that very little of what is held is for the long-term or common use. A project is ordered, the parts arrive and are entered into the computer, and the parts sent out for assembly into the final machine.

The projects built by MAPS Assembly can be initiated in one of two ways. First, and the most common way, is an order placed by a plant. This is when a plant determines that a certain machine that it owns is obsolete or is beyond repair and they have the time and capital available to replace it. These orders are generated through a computer system, although there is considerable communication and there are several site visits between MAPS and the plants. After the machine has been ordered, it is up to the department to plan the schedule, review the blueprints, contact and line up suppliers, place the orders and receive and assemble the parts. If new additions have been added to the machines, an engineer is assigned to the project. This is not common.

The second and less common way for a machine to be ordered is for General Machine Development (GMD), Oscar Mayer's engineering design department, to order a new machine. This machine is more prototype than production oriented, meaning that there are no machines of this type yet in existence, as opposed to plant orders that replace existing machines. Some of these machines are substitutes for existing machines, and some create entirely new processes. However, all of these machines are placed in production either by removing previous plant capabilities, enhancing present plant capabilities, or by building new plants. Obviously, if these machines are able to function well and properly within the Oscar Mayer system, when they need replacement they are ordered by the plants as previously stated. This indicates the dependance of the MAPS Assembly work on capital budgeting by Oscar Mayer. With less budget, fewer machines will be built.

There is a third category of orders which makes up a minimal amount of the work the department does. These are reworking machines. In these instances, a machine is taken from a plant, cleaned, brought up to the latest engineering changes and specifications, has its worn items replaced (such as sprockets, bearings, etc.) and is placed back in the plant from which it came. This is a much cheaper process because the necessary framework and fabricated parts already exist and merely need inspection to check for wear. Lately, there has been an increase in this type of work.

At any one time it is not unusual to be assembling two or three GMD machines, two or three plant orders, and perhaps a single rework machine. Each machine will be composed of somewhere between 100 and 1000 parts with costs ranging from $20,000 to $1.5 million to purchase and assemble. The average range, however, is in the $50,000 to $200,000 range. The number of parts per machine is quite simply what the engineer who designed the machine has specified on the blueprint - two sprockets of this type, four shafts with such and such dimensions, 100 feet of this tubing, etc.

The number of parts actually held in inventory rose from 26,017 on January 6, 1989 to 28,107 on September 8, 1989. During that same time, the average number of parts received weekly was 472 and the average number of parts disbursed (sold) was 302.

The problem with this inventory increase can be clearly seen in the weekly data in Appendix I (Table A-1). This shows the unusual and disturbing rise in inventory value over a selected period (January 1989 through September 1989). This is also graphically detailed in Figure 1.

The theory upon which the MAPS inventory is built, for all intents and purposes, is that if $50,000 worth of parts arrived one day, the following day, or week, $50,000 worth of parts should leave. Manifestly, this is not happening. The figures show that inventory value is increasing. This results from the backlogging of projects. It is this backlogging of projects, and thus the ever increasing inventory, which presents the background for this case study. If a part is ordered in for a project, and the project is backlogged, there is a great deal of time before that part may be called into use again. For example, part number 403411013, a lock stud, was used once in three years. In all parts randomly selected for this study, there was at least a one year gap in parts usage for all parts, with one exception. Obviously, this causes great inventory increases. Every part chosen shows a similar pattern of non-usage over long periods of time.

In a custom engineering environment, such as the Machine Assembly segment, there is no way to forecast demand. As such, there is little way to clear the shop floor for incoming projects or to pre-order those long lead time items that would enable a smoother flow and a reduction in backlog. This is the nature of the job-shop beast.

The inventory is operating naturally, with finite resources. In fact, due to a recent company-wide policy, head counts are frozen - no new hires. It is questionable, however, that even if employment figures were allowed to float naturally that any further manpower would be allotted to the inventory. Simply put, the backlog of projects and parts are putting too much of a stress on the physical ability of the manpower to deal with the maintenance of existing inventory. Inventory by its very nature is the physical movement, stocking, and handling of parts. There is no additional space available or even contemplated for this inventory.

This background makes it apparent that the situation is reaching a point where it must be attended to. Because no further labor or space is to be expected, alternatives for dealing with the parts flow must be found. Additionally, while taxes are not paid on the inventory (because of its being classified as a work-in-process inventory) it is a great deal of money to tie up in non-use capital. Also, because assembly parts are not taxed, neither can they be depreciated. This leaves Oscar Mayer with $2 million in dead capital. In fact, while the inventory received and sold approximately $7 million in 1990, this volume is expected to increase in 1991.

The alternatives which will be investigated include a complete implementation of a just-in-time inventory system, a partial implementation using selected JIT principles, and simply remaining with the system already in place.

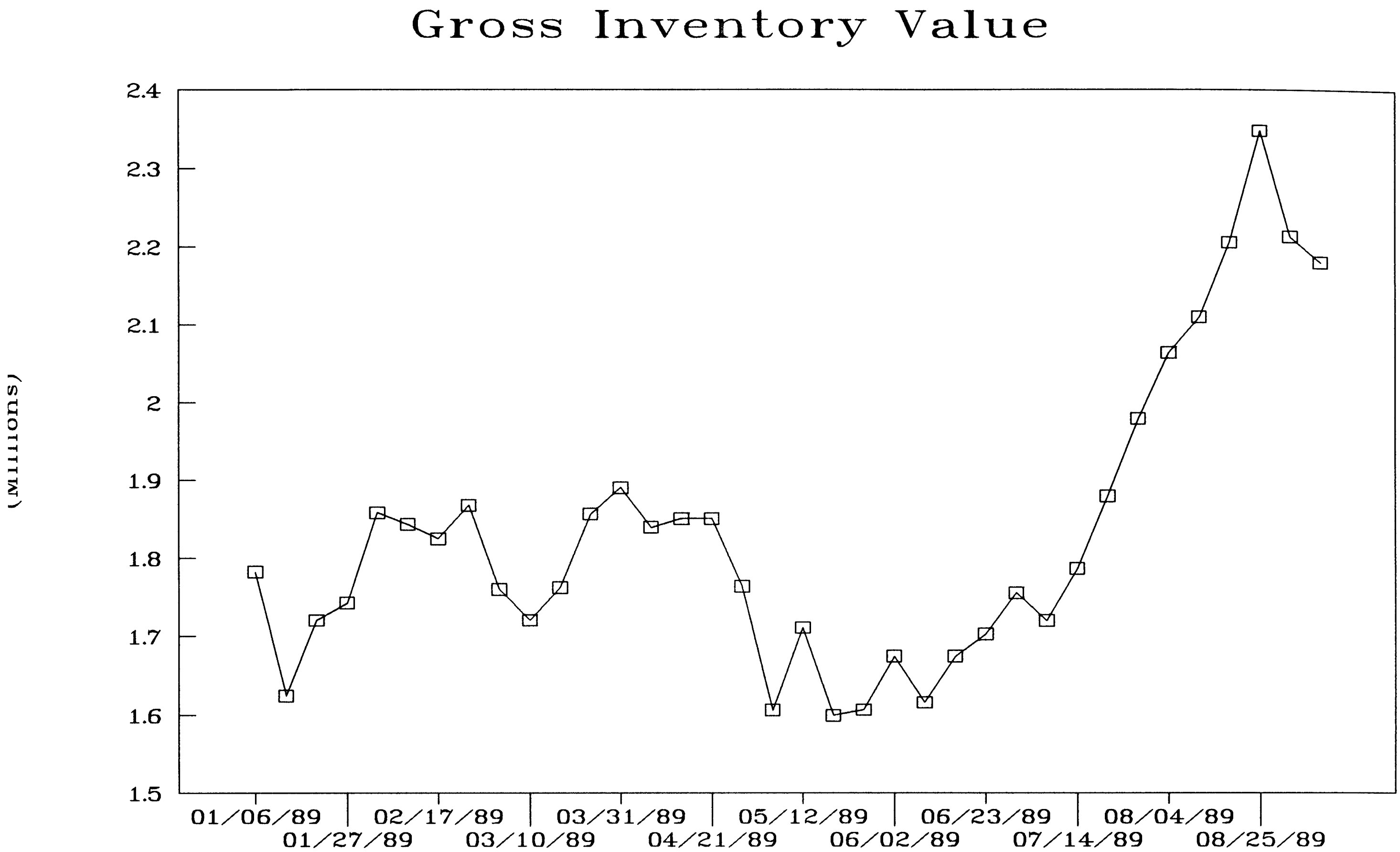
Gross Inventory Value
(Millions)
2.4
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
01/06/89
01/27/89
02/17/89
03/10/89
03/31/89
04/21/89
05/12/89
06/02/89
06/23/89
07/14/89
08/04/89
08/25/89

FIGURE 1

# SECTION II

# LITERATURE REVIEW

The whole area of just-in-time seems lost in a swirl of acronyms with different terms and ideas mixing and mingling. Because the subject deals with an environment of which JIT is a component a brief definition of terms will be helpful.

## Just-in-time

Just-in-time (JIT) is the effort to reduce lead time and lot sizes of manufactured and purchased parts to achieve flexibility. This is based on the idea that if set-up time is reduced, lot size can economically be reduced (Wallace, 1989).

## MRP

MRPII, an extension of MRP (materials requirements planning), was developed in the 1960s as a computer based way to order and schedule material. The underpinning of this program was the asking of four logical questions about the manufacturing situation: What are we going to make, What does it take to make it, What do we have, and What do we have to get ("MRP II: Managing a Manufacturing Company", 1987).

The 1970's brought the evolution of MRP into MRPII. According to Thomas F. Wallace (1987), a Cincinnati based

MRPII consultant, MRPII was able to detect when the due date of an order was out of synch with its need date. He states that "For the first time ever in manufacturing, there was a formal mechanism for keeping priorities valid in a manufacturing environment." (MRP II: Managing a Manufacturing Company, 1987). This led to MRPII (manufacturing resource planning) by adding the ability to view the operating plan in financial terms and creating the ability for users to ask "What if?" questions.

The place for JIT

What JIT did for American manufacturing and the manufacturing process cannot be overstated. The introduction of computers into the planning and flow of the process might be considered a revolution in and of itself. But perhaps the impact of computers and control can be overstated. As stated earlier, JIT is merely a piece of an environment. In fact, the literature almost leads us to the classic chicken and egg question. Which came first, the MRP or the JIT? Reginald Sobczak (1990) states that

> MRPII is not merely an element of JIT, but a structure that promotes the JIT concept. MRPII provides essential information needed to reduce lead times, order quantities, setup times, and inventory levels. JIT requires a stable master schedule, which is uniform from day to day, while MRP allows a highly variable master schedule. (p. 12)

At the same time, Roger Harker, President of Bentley Scientific Company, considers JIT a part of MRP and calls it its "...rack and pinion." (Sobczak, 1990, p.12).

Suppliers

JIT intimately involves the suppliers in the manufacturer's business. This is a logical step because U.S. manufacturers spend an average of 56 cents of every sales dollar purchasing production materials (Burt, 1989). And, one of the underlying requirements of JIT is that parts arrive at the manufacturer's perfect, or as close as is possible. In fact, vendor-supplier relations, which have historically, and certainly in MAPS, been adversarial relationships, must become partnerships.

There is a great emphasis placed on single source suppliers. By reducing the vendor base, the manufacturer increases the leverage they have with their suppliers. This intimate relationship leads the suppliers to work harder for quality parts and supplies. Also, with the manufacturer becoming closer to single suppliers, the suppliers begin to feel a part of the manufacturer's team and thus are less resentful and more cooperative in intensive and thorough quality audits.

Xerox is a good example of this idea in practice. By rigorous management, Xerox was able to reduce its vendor base to 400, down from 5,000. In addition, it trained its suppliers in statistical process control, JIT manufacturing, and total quality commitment (Xerox's version of a quality program). This led to a reduced net product cost of 10% per year and rejects of incoming parts were reduced by 93%. Also, production lead times were reduced to 18 weeks from 52 and new product development, because of the close association with vendors, was reduced by 50% (Burt, 1989).

According to Burt (1989) five key questions will determine whether companies can achieve the dramatic results Xerox was able to reach: 1) Is the company sensibly organized to select suppliers, 2) Does the design process team include suppliers, 3) Are the suppliers addressing quality standards up front, 4) Are suppliers earning a fair profit, 5) Are supplier relationships managed to ensure long term growth in supplier's skills.

It must be emphasized that the supplier-manufacturer relationship has been historically adversarial. JIT requires trust between the two and the confidence of each. This poses as great a challenge to a manufacturer as any problem they presently face. Certification programs, an essential process to implement JIT, usually constitutes a rather searching, broad range and often intimate look at the supplier's financial, organizational, and quality control program. An example of Oscar Mayer's current certification procedure is given in Appendix II.

A number of positive steps have been reached already by Oscar Mayer's partial implementation of the Supplier Quality

Profile. Quality plays such a vital role in JIT because the lack of it makes the processs of receival and usage slow down considerably. The Supplier Quality Profile is performed by the MAPS Quality Control team at the supplier's place of manufacture. The points included in the profile are gone over carefully and discussed with the suppliers and a determination is made by our Quality Control people on the commitment of the supplier to these principles. Previously, the title of the Quality Control team was the Inspection Department. That evolved from the department's duties of inspecting all incoming parts. By certifying vendors using the profile, incoming inspection can be eliminated because adherence to the profile results in limited rejects. This eliminates the need for inspection - hence the name change.

The process of certifying vendors is a long one, sometimes taking more than a year. From Oscar Mayer's standpoint, quality (and thus the profile) have been the sole criteria used to date. This, however, has avoided pricing, delivery dates, etc. Currently, the Purchasing team is working on their own profile to mesh with that of the Quality team to bring these issues into consideration.

The net result, for the assembly of machines, has been a decrease in lead time needed for ordering. Parts arriving at the door are now either inspected on the road or are purchased from certified vendors. This completely removes the need of a staging area for inspection and the on-hand scrutiny of all incoming parts. With the figures seen previously of the number of incoming parts weekly, the advantage is obvious.

Employees

Employee involvement is also a fundamental of JIT. This is true because, not only does it require a great commitment from the workers, but JIT is guaranteed, and rooted in the principle, of uncovering problems. The analogy constantly linked with JIT is a man rowing down a stream. As the water level lowers (inventory reduction), the rocks begin to appear above the water. Therefore, as the inventory levels lower, the problems in the manufacturing system begin to make themselves more apparent. The commitment and understanding from the workers becomes necessary so that these problems present themselves as opportunities. Thus the focus must be turned towards continual improvement, not sweeping the problems under the rug or trying to cover them up by increasing inventory. This commitment goes hand in hand with employees being willing to take on greater responsibilities, particularly for quality.

The examples of successful JIT users are legion. JIT does work. For example, McDonnell Douglas implemented JIT and within a year found total inventory down 38%, work in process down 40%, total rework down 40%, engineering rework down 80%, inventory turnover up 100%, and set-up time reduced by 50% (Kuzela, 1988). Workers at Jacobs Vehicle Equipment Company in Bloomfield, Connecticut now use as a recreational area a 60,000 square foot area formerly devoted to production equipment and excess inventory. NCR, which began its JIT in 1986, reduced on-hand inventory from 110 days worth to just 21 days worth (Sheridan, 1989). The list appears almost endless.

The Machine Assembly and Parts Supply Assembly Inventory can best be defined as a job-shop, custom engineering inventory. While it is unique in that it is internal, not external to a manufacturing environment, this inventory in no way approaches what could be termed repetitive manufacturing. The usage is erratic. There is no recurring pattern at all to be found. As stated before, parts may be used once every three years. In fact, parts may be set up as legitimate parts, ordered in, and never used again because of engineering changes. This, too, adds to inventory bloat. This presents the greatest challenge to JIT in the Assembly Inventory.

Unfortunately, the body of literature available on JIT and MRP provides examples and rules applicable almost exclusively to repetitive and batch manufacturing - the complete opposite of a job-shop environment. While mounds of information detailed the implementation of JIT and MRP in repetitive environments, few articles were available which even remotely touched on JIT in a unique, made-to-order, job-shop environment.

This should not, however, lead to the complete abandonment of JIT. In fact, most companies find that, repetitive manufacturing or not, they require a hybrid of JIT, MRP, Kanban, etc, suited and tailored to their needs. Uday Karmarkar (1989) writes that in the

> more dynamic, variable contexts - like job shop manufacturing - MRP becomes invaluable for planning and release...Shop floor control requires higher levels of tracking and scheduling sophistication. Materials flow is too complex for strict JIT." (p.127) He continues that "in very complex environments, even job release requires sophisticated push methods. Where these are too expensive, the only option is to live with poor time performance, large inventories, and plenty of tracking and expediting.(p.127)

This may be an overly pessimistic view of the potential of JIT. There may be room for compromise. His "Tailored Productions Controls" exhibit strikes so closely to the heart of the matter that it is reproduced in Figure 1 (Appendix 3) from his article "Getting Control of Just-in-time" from the September-October, 1989, Harvard Business Review. This figure explores the possibilities of production from the continuous flow through custom engineering and how each will or will not accept MRP/JIT. The basis of these definitions is the repeatability of the manufactured item.

It continues on to explore the role which lead times play in each environment. As indicated previously, its great value in terms of this paper is its explicit look at JIT in a custom-engineering/job-shop environment.

It becomes evident from this figure with its comprehensive view on the batch/custom manufacturing and variable lead time descriptions, and the accompanying description of a custom engineering environment, that the Assembly Inventory falls into the custom category and thus questions JIT's ability in the environment in which MAPS operates. Indeed, Richard C. Walleigh (1986) states that "If a job shop got only unique orders whose patterns were unpredictable, just-in-time production would meet with little success." (p.51)

In summary, a great deal of information is available on those who have successfully implemented JIT and no lack of figures representing their rewards. However, with the few exceptions noted in this literature review, the available material rarely contemplates the mixing of job-shop and JIT. Because MAPS can be considered a custom-engineering environment, those that do give information about JIT and job shop are applicable.

# SECTION III

# DATA

The data in Appendix I are chosen from the part numbers listed in the periodic of parts used by Oscar Mayer Foods Corporation in their machine assembly and replacement parts. These were chosen by blindly opening the periodic to a random page and simply pulling the first number of every tenth page: A sample of eleven was considered ample because it is so completely representative of the parts which are used in the assembly process of custom made machinery that drawing out further samples would have been redundant. Every part chosen shows a similar pattern of non-usage over long periods of time.

This random selection, and the tables of parts receivals, disbursals, and gross inventory value (Appendix 1) are used to indicate not only the parameters of the inventory, but the non-repeatability of the items which flow through the inventory.

On the tables representing parts usage, the part numbers are preceded by a four (4) to indicate that they are standard parts and are used throughout the Oscar Mayer system (Tables A-4 through A-14, Appendix 1). These parts were chosen because they are non-hardware items, with pre-fixes below 299 which are not purchased as off-the-shelf standard, easily acquired items. All part numbers below 299 are fabricated by our vendors from blue prints supplied by us.

The listed columns indicate usage over the dates shown. A zero, obviously means none used, while any other number indicates the amount used. The initial data is order time for the preceding order. For example, an order time of four (4) would indicate the last order for this part took four weeks to arrive. Tables A-2 and A-3 are tables indicating dollar value of receivals (parts purchased and entering inventory) and disbursals (parts sold and leaving the inventory). These tables indicate the activity in dollar volume the inventory participates in.

This data was collected from the common and usual weekly computer print-outs provided to the Assembly Inventory and directly from the inventory computer system itself. All data is entered by Oscar Mayer personnel or is a collation of that data.

The data clearly show an erratic and unknowable pattern of usage in these randomly selected parts. It also indicates that, once bought in, a part can remain unused for up to three years.

# SECTION IV

# DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

Three options can be examined which were stated earlier; full JIT implementation, partial and selective JIT, or remaining with the system currently in place.

## Discussion

Initially, the entire subject can be scrutinized with an overview using the questions presented by Burt (1989). Is the company sensibly organized to select suppliers? It can be argued that, given the rudimentary state of Oscar Mayer's vendor certification program, as seen in the Quality Profile, and the inability for our Purchasing group to yet be involved in the process, the answer would be a qualified no. The personnel are available as broken down in the Quality and Purchasing teams, but we have not yet brought that potential to fruition. Even with Purchasing coming fully into force, such areas as shipping, packing, and various other details such as clear parts identification (very important to inventory) have yet to find a space in the vendor audit. So that while the department is not yet sensibly organized to select suppliers, it is capable of doing so in the future.

Does the design team include suppliers? Emphatically no. There are occasions when the department calls on the expertise of suppliers for alternatives to material, but this is rare.

Are the suppliers addressing quality standards up front? More and more, yes. In fact, it has been known that some suppliers easily navigate the Quality Profile because they have already implemented greater quality standards than we require.

Are the suppliers earning a fair profit? Yes.

Are supplier relationships managed to ensure long term growth in supplier's skills? No. In many ways, the supplier base is more skilled at the production of parts than we are. Because while we also assemble, they concentrate solely on producing fabricated parts. Additionally, and as will be seen in more detail later, the department is still working out of an adversarial relationship with suppliers.

## Conclusions

So can a full JIT be implemented? Sadly no, it cannot. As is made abundantly clear by the detail Burt (1989) provides, Oscar Mayer must be considered a custom engineer. Differing lead times, no regularity in machines ordered or used, differing loads at different times, and little or no advance knowledge of upcoming assemblies. According to Burt, this is not an area capable of JIT implementation. His suggestion is for MRP to be used as an information tool to track purchase orders, bills, etc. It is not an area in which JIT will thrive.

Conversely, leaving the situation the same is not only unacceptable given the gross non-use of funds and potential increasing demands on the inventory, but it appears not to be a solution the department itself is willing to accept. From the time that this report was begun, the Quality team has developed their Profile and the Purchasing section is now gathering together their information to join the certification effort. But even excluding the work already in progress, doing nothing would simply lead to a larger and more unwieldy inventory than we presently have.

## Recommendations

The recommendation is then a partial implementation of the principles of JIT. Specifically, the department is operating now with a computer system that does contain some very basic fundamentals of an MRP-based computer program such as correlating purchase orders and providing needed parts lists. In this way, Burt's scheme is very effective. This could be enhanced for use more as an MRP tool with the assistance of the Management Information Services Department to include a project memory taking lead times into account, quality procedures into account, vendor information, financial data to allow quoting and more timely and responsive issuances of purchase orders. This would be, by any reckoning, an expensive undertaking. Information services would have to rewrite inventory programs which are used nationwide and integrate them into the existing system. This in itself would be a great expense. This could only be accomplished after a thorough review by MAPS and almost certainly need a consultation with an outside MRP expert. If, by reducing space and labor needs the inventory were to reduce costs by $30,000 per year and with a conservative estimate of $150,000 for the upgrade and conversion of the computer system, there is a five year pay back period. This could be considered to be within reasonable bounds.

This would reduce inventory by, first, reducing dollar value if parts are quoted. This guarantees the lowest of the capable vendors receiving the contract and producing a lower holding value. Secondly, reduced lead times means parts will have to be stored for a shorter period than would otherwise be seen. Quality procedures and financial data additionally allow a faster moving inventory so that projects need not remain in inventory awaiting assembly because parts are wrong or are missing.

The inventory, after a successful implementations of the applicable JIT principles, would operate in a much quicker mode with quotations being issued off an enhanced computer system to reduce parts cost and holding times. Also, these quotations and parts awarded would be sent only to those vendors who have successfully been certified by our quality procedure. This reduces the potential of receiving incorrect parts and thus reduces backlogging of projects on the basis of incompleteness. Because many items which rest for long periods in inventory are results of improper ordering or canceled projects, an enhanced computer system leaning more towards a true MRP approach will reduce mistakes. Additionally, any organization and increased inventory flow reduces needed space and manpower and therefore reduces overall inventory costs.

Additionally, we are presently in a rather adversarial relationship with most of our suppliers. This inhibits the free flow of information between us. There have been leanings lately towards a more cooperative approach with our vendors. This, however, is still in its infancy. A bold attempt to follow through on the JIT principle of supplier trust and confidence would place us in much better circumstances to request more timely deliveries, lower lot sizes, cheaper parts, and technical assistance to avoid costly parts orders which result in unusable parts clogging the inventory system.

The vendor certification procedure I have referred to throughout this paper is moving forward. As I mentioned, this has already reduced the need for a staging area in which to inspect the incoming parts and has reduced the need for inventory space - a very precious resource. I believe that with a more comprehensive understanding of the vendor certification procedure and how it relates to JIT and reduced inventories, we would find that inventories could be dropped significantly. Also, with no inspection and a stable of quality, certified vendors, the large amount of time now spent on acquiring new vendors could go towards improving and growing closer to those we certify.

Employee involvement is also a JIT principle that would be transferable to our job-shop, custom engineering environment. It doesn't particularly matter what you build, if your employees can be educated to view problems as opportunities, to become more involved in the process and committed to quality, your product and environment will improve. The limiting factor in our case, though it does not exclude the proposal, is that the assemblers of the machines are union. This imposes definite restrictions as to responsibilities they are willing and able to assume and compensation (such as rewards) they can receive. Again though, this does not exclude them from being educated to the principles for JIT and quality. Educational programs can be developed in-house or experts can be obtained who are able to educate the employees on how JIT can and should work.

JIT will never be fully implemented in a custom engineering, job-shop environment. There are too many variables and far too few constants. Lead times are unknown, orders are random, parts usage is random. But the complete abandonment of JIT would be regrettable. The principles and ideas of JIT that have been illustrated can be brought to any environment. Some do transfer, even into the unpredictability of custom engineering and it is recommended that Oscar Mayer MAPS make better use of the computer system to correlate purchase orders and provide parts lists, provide a project memory to track a project from start to finish, integrate local and national inventory systems, and continue to develop a more cooperative relationship with vendors through the vendor certification program.

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# APPENDIX I

GROSS INVENTORY VALUE

| DATE | VALUE | PERCENT CHANGE |
|---|---|---|
| 09/08/89 | 2,180,114 | |
| 09/01/89 | 2,212,976 | 1.5% |
| 08/25/89 | 2,348,175 | 6.1% |
| 08/18/89 | 2,205,595 | -6.1% |
| 08/11/89 | 2,109,636 | -4.4% |
| 08/04/89 | 2,063,789 | -2.2% |
| 07/28/89 | 1,978,958 | -4.1% |
| 07/21/89 | 1,879,088 | -5.0% |
| 07/14/89 | 1,786,072 | -5.0% |
| 07/07/89 | 1,719,861 | -3.7% |
| 06/30/89 | 1,755,159 | 2.1% |
| 06/23/89 | 1,703,035 | -3.0% |
| 06/16/89 | 1,674,951 | -1.6% |
| 06/09/89 | 1,616,296 | -3.5% |
| 06/02/89 | 1,674,789 | 3.6% |
| 05/26/89 | 1,606,751 | -4.1% |
| 05/19/89 | 1,599,417 | -0.5% |
| 05/12/89 | 1,711,249 | 7.0% |
| 05/05/89 | 1,606,186 | -6.1% |
| 04/28/89 | 1,764,419 | 9.9% |
| 04/21/89 | 1,850,401 | 4.9% |
| 04/14/89 | 1,850,510 | 0.0% |
| 04/07/89 | 1,839,142 | -0.6% |
| 03/31/89 | 1,890,110 | 2.8% |
| 03/24/89 | 1,856,130 | -1.8% |
| 03/17/89 | 1,762,131 | -5.1% |
| 03/10/89 | 1,720,830 | -2.3% |
| 03/03/89 | 1,760,349 | 2.3% |
| 02/24/89 | 1,867,408 | 6.1% |
| 02/17/89 | 1,824,905 | -2.3% |
| 02/10/89 | 1,842,905 | 1.0% |
| 02/03/89 | 1,858,342 | 0.8% |
| 01/27/89 | 1,742,437 | -6.2% |
| 01/20/89 | 1,720,525 | -1.3% |
| 01/13/89 | 1,624,313 | -5.6% |
| 01/06/89 | 1,782,287 | 9.7% |

TABLE A-1

RECEIVALS

| DATE | VALUE | PERCENT CHANGE |
| --- | --- | --- |
| 09/08/89 | 98,880 | |
| 09/01/89 | 60,797 | -38.5% |
| 08/25/89 | 183,444 | 201.7% |
| 08/18/89 | 187,284 | 2.1% |
| 08/11/89 | 127,270 | -32.0% |
| 08/04/89 | 118,933 | -6.6% |
| 07/28/89 | 124,977 | 5.1% |
| 07/21/89 | 95,289 | -23.8% |
| 07/14/89 | 118,649 | 24.5% |
| 07/07/89 | 31,744 | -73.2% |
| 06/30/89 | 126,571 | 298.7% |
| 06/23/89 | 149,579 | 18.2% |
| 06/16/89 | 149,495 | -0.1% |
| 06/09/89 | 93,595 | -37.4% |
| 06/02/89 | 86,399 | -7.7% |
| 05/26/89 | 87,013 | 0.7% |
| 05/19/89 | 50,170 | -42.3% |
| 05/12/89 | 143,053 | 185.1% |
| 05/05/89 | 51,155 | -64.2% |
| 04/28/89 | 41,540 | -18.8% |
| 04/21/89 | 28,607 | -31.1% |
| 04/14/89 | 42,721 | 49.3% |
| 04/07/89 | 26,967 | -36.9% |
| 03/31/89 | 45,372 | 68.3% |
| 03/24/89 | 71,636 | 57.9% |
| 03/17/89 | 84,801 | 18.4% |
| 03/10/89 | 122,456 | 44.4% |
| 03/03/89 | 33,208 | -72.9% |
| 02/24/89 | 77,672 | 133.9% |
| 02/17/89 | 13,841 | -82.2% |
| 02/10/89 | 95,991 | 593.5% |
| 02/03/89 | 132,551 | 38.1% |
| 01/27/89 | 42,094 | -68.2% |
| 01/20/89 | 110,008 | 161.3% |
| 01/13/89 | 52,026 | -52.7% |
| 01/06/89 | 44,340 | -14.8% |

TABLE A-2

DISBURSALS

| DATE | VALUE | PERCENT CHANGE |
|---|---|---|
| 09/08/89 | 141,399 | |
| 09/01/89 | 206,310 | 45.9% |
| 08/25/89 | 43,103 | -79.1% |
| 08/18/89 | 117,893 | 173.5% |
| 08/11/89 | 179,729 | 52.5% |
| 08/04/89 | 40,306 | -77.6% |
| 07/28/89 | 46,118 | 14.4% |
| 07/21/89 | 78,063 | 69.3% |
| 07/14/89 | 60,629 | -22.3% |
| 07/07/89 | 38,669 | -36.2% |
| 06/30/89 | 78,728 | 103.6% |
| 06/23/89 | 171,911 | 118.4% |
| 06/16/89 | 93,237 | -45.8% |
| 06/09/89 | 175,061 | 87.8% |
| 06/02/89 | 15,723 | -91.0% |
| 05/26/89 | 88,867 | 465.2% |
| 05/19/89 | 159,743 | 79.8% |
| 05/12/89 | 33,971 | -78.7% |
| 05/05/89 | 55,871 | 64.5% |
| 04/28/89 | 128,892 | 130.7% |
| 04/21/89 | 47,176 | -63.4% |
| 04/14/89 | 23,452 | -50.3% |
| 04/07/89 | 65,628 | 179.8% |
| 03/31/89 | 60,537 | -7.8% |
| 03/24/89 | 8,472 | -86.0% |
| 03/17/89 | 52,131 | 515.3% |
| 03/10/89 | 178,504 | 242.4% |
| 03/03/89 | 144,237 | -19.2% |
| 02/24/89 | 38,379 | -73.4% |
| 02/17/89 | 29,665 | -22.7% |
| 02/10/89 | 137,645 | 364.0% |
| 02/03/89 | 12,546 | -90.9% |
| 01/27/89 | 30,402 | 142.3% |
| 01/20/89 | 18,790 | -38.2% |
| 01/13/89 | 211,500 | 1025.6% |
| 01/06/89 | 1,018 | -99.5% |

TABLE A-3

403411013 STUD, LOCK - OD 1-1/8 L 1.0 ZP

| ORDER TIME | | | | | |
|---|---|---|---|---|---|
| LAST | 2ND LAST | 3RD LAST | 4TH LAST | 5TH LAST | AVERAGE |
| 16 | 1 | 12 | 0 | 0 | 10 |

| MONTH | USAGE |
|---|---|
| 11/89 | 0 |
| 10/89 | 0 |
| 09/89 | 0 |
| 08/89 | 0 |
| 07/89 | 0 |
| 06/89 | 0 |
| 05/89 | 0 |
| 04/89 | 0 |
| 03/89 | 0 |
| 02/89 | 0 |
| 01/89 | 0 |
| 12/88 | 0 |
| 11/88 | 0 |
| 10/88 | 0 |
| 09/88 | 0 |
| 08/88 | 0 |
| 07/88 | 0 |
| 06/88 | 0 |
| 05/88 | 1 |
| 04/88 | 0 |
| 03/88 | 0 |
| 02/88 | 0 |
| 01/88 | 0 |
| 12/87 | 0 |
| 11/87 | 0 |
| 10/87 | 0 |
| 09/87 | 0 |
| 08/87 | 0 |
| 07/87 | 0 |
| 06/87 | 0 |
| 05/87 | 0 |
| 04/87 | 0 |
| 03/87 | 0 |
| 02/87 | 0 |
| 01/87 | 0 |
| 12/86 | 0 |

TABLE A-4

403411076 WELDMENT, FEED PICKUP

| ORDER TIME | | | | | |
|---|---|---|---|---|---|
| LAST | 2ND LAST | 3RD LAST | 4TH LAST | 5TH LAST | AVERAGE |
| 4 | 1 | 17 | 0 | 0 | 7 |

| MONTH | USAGE |
|---|---|
| 11/89 | 0 |
| 10/89 | 0 |
| 09/89 | 0 |
| 08/89 | 0 |
| 07/89 | 0 |
| 06/89 | 0 |
| 05/89 | 0 |
| 04/89 | 0 |
| 03/89 | 0 |
| 02/89 | 0 |
| 01/89 | 0 |
| 12/88 | 0 |
| 11/88 | 0 |
| 10/88 | 0 |
| 09/88 | 0 |
| 08/88 | 0 |
| 07/88 | 0 |
| 06/88 | 0 |
| 05/88 | 1 |
| 04/88 | 0 |
| 03/88 | 0 |
| 02/88 | 0 |
| 01/88 | 0 |
| 12/87 | 0 |
| 11/87 | 0 |
| 10/87 | 0 |
| 09/87 | 0 |
| 08/87 | 0 |
| 07/87 | 0 |
| 06/87 | 0 |
| 05/87 | 0 |
| 04/87 | 0 |
| 03/87 | 0 |
| 02/87 | 0 |
| 01/87 | 0 |
| 12/86 | 0 |

TABLE A-5

4036-58855 ASSEMBLY, #1-5, #12-15 ROLLER

| ORDER TIME | | | | | |
| --- | --- | --- | --- | --- | --- |
| LAST | 2ND LAST | 3RD LAST | 4TH LAST | 5TH LAST | AVERAGE |
| 8 | 6 | 11 | 11 | 11 | 9 |

| MONTH | USAGE |
| --- | --- |
| 11/89 | 18 |
| 10/89 | 0 |
| 09/89 | 53 |
| 08/89 | 21 |
| 07/89 | 0 |
| 06/89 | 0 |
| 05/89 | 0 |
| 04/89 | 0 |
| 03/89 | 18 |
| 02/89 | 0 |
| 01/89 | 0 |
| 12/88 | 0 |
| 11/88 | 36 |
| 10/88 | 0 |
| 09/88 | 0 |
| 08/88 | 18 |
| 07/88 | 0 |
| 06/88 | 0 |
| 05/88 | 0 |
| 04/88 | 36 |
| 03/88 | 0 |
| 02/88 | 0 |
| 01/88 | 18 |
| 12/87 | 0 |
| 11/87 | 0 |
| 10/87 | 0 |
| 09/87 | 0 |
| 08/87 | 0 |
| 07/87 | 0 |
| 06/87 | 0 |
| 05/87 | 0 |
| 04/87 | 0 |
| 03/87 | 0 |
| 02/87 | 0 |
| 01/87 | 0 |
| 12/86 | 0 |

TABLE A-6

410158118 ASSEMBLY, DRIVE IDLER

| ORDER TIME | | | | | |
|---|---|---|---|---|---|
| LAST | 2ND LAST | 3RD LAST | 4TH LAST | 5TH LAST | AVERAGE |
| 1 | 5 | 3 | 1 | 3 | 3 |

| MONTH | USAGE |
|---|---|
| 11/89 | 1 |
| 10/89 | 2 |
| 09/89 | 3 |
| 08/89 | 2 |
| 07/89 | 0 |
| 06/89 | 0 |
| 05/89 | 0 |
| 04/89 | 1 |
| 03/89 | 1 |
| 02/89 | 0 |
| 01/89 | 0 |
| 12/88 | 0 |
| 11/88 | 3 |
| 10/88 | 0 |
| 09/88 | 0 |
| 08/88 | 0 |
| 07/88 | 0 |
| 06/88 | 0 |
| 05/88 | 1 |
| 04/88 | 2 |
| 03/88 | 0 |
| 02/88 | 1 |
| 01/88 | 1 |
| 12/87 | 0 |
| 11/87 | 1 |
| 10/87 | 0 |
| 09/87 | 0 |
| 08/87 | 0 |
| 07/87 | 0 |
| 06/87 | 0 |
| 05/87 | 0 |
| 04/87 | 0 |
| 03/87 | 0 |
| 02/87 | 0 |
| 01/87 | 0 |
| 12/86 | 0 |

TABLE A-7

421121079 LOCATOR, SS

| ORDER TIME | | | | | |
| --- | --- | --- | --- | --- | --- |
| LAST | 2ND LAST | 3RD LAST | 4TH LAST | 5TH LAST | AVERAGE |
| 7 | 6 | 1 | 0 | 0 | 5 |

| MONTH | USAGE |
| --- | --- |
| 11/89 | 0 |
| 10/89 | 0 |
| 09/89 | 3 |
| 08/89 | 0 |
| 07/89 | 0 |
| 06/89 | 0 |
| 05/89 | 0 |
| 04/89 | 0 |
| 03/89 | 0 |
| 02/89 | 9 |
| 01/89 | 0 |
| 12/88 | 0 |
| 11/88 | 0 |
| 10/88 | 0 |
| 09/88 | 0 |
| 08/88 | 0 |
| 07/88 | 0 |
| 06/88 | 0 |
| 05/88 | 0 |
| 04/88 | 0 |
| 03/88 | 0 |
| 02/88 | 0 |
| 01/88 | 0 |
| 12/87 | 0 |
| 11/87 | 0 |
| 10/87 | 0 |
| 09/87 | 0 |
| 08/87 | 0 |
| 07/87 | 0 |
| 06/87 | 0 |
| 05/87 | 0 |
| 04/87 | 0 |
| 03/87 | 0 |
| 02/87 | 0 |
| 01/87 | 0 |
| 12/86 | 0 |

TABLE A-8

421130059 PAD

| ORDER TIME | | | | | |
|---|---|---|---|---|---|
| LAST | 2ND LAST | 3RD LAST | 4TH LAST | 5TH LAST | AVERAGE |
| 5 | 8 | 1 | 19 | 4 | 7 |

| MONTH | USAGE |
|---|---|
| 11/89 | 3 |
| 10/89 | 0 |
| 09/89 | 3 |
| 08/89 | 0 |
| 07/89 | 0 |
| 06/89 | 0 |
| 05/89 | 0 |
| 04/89 | 0 |
| 03/89 | 0 |
| 02/89 | 15 |
| 01/89 | 0 |
| 12/88 | 0 |
| 11/88 | 6 |
| 10/88 | 0 |
| 09/88 | 0 |
| 08/88 | 0 |
| 07/88 | 0 |
| 06/88 | 0 |
| 05/88 | 0 |
| 04/88 | 0 |
| 03/88 | 3 |
| 02/88 | 0 |
| 01/88 | 3 |
| 12/87 | 0 |
| 11/87 | 0 |
| 10/87 | 0 |
| 09/87 | 0 |
| 08/87 | 0 |
| 07/87 | 0 |
| 06/87 | 0 |
| 05/87 | 6 |
| 04/87 | 0 |
| 03/87 | 1 |
| 02/87 | 0 |
| 01/87 | 0 |
| 12/86 | 0 |

TABLE A-9

421365053 SPACER, VERTICAL

| ORDER TIME | | | | | |
|---|---|---|---|---|---|
| LAST | 2ND LAST | 3RD LAST | 4TH LAST | 5TH LAST | AVERAGE |
| 7 | 1 | 10 | 1 | 4 | 5 |

| MONTH | USAGE |
|---|---|
| 11/89 | 0 |
| 10/89 | 0 |
| 09/89 | 0 |
| 08/89 | 0 |
| 07/89 | 0 |
| 06/89 | 1 |
| 05/89 | 0 |
| 04/89 | 0 |
| 03/89 | 1 |
| 02/89 | 0 |
| 01/89 | 0 |
| 12/88 | 0 |
| 11/88 | 0 |
| 10/88 | 0 |
| 09/88 | 0 |
| 08/88 | 0 |
| 07/88 | 0 |
| 06/88 | 0 |
| 05/88 | 0 |
| 04/88 | 1 |
| 03/88 | 0 |
| 02/88 | 0 |
| 01/88 | 0 |
| 12/87 | 0 |
| 11/87 | 0 |
| 10/87 | 0 |
| 09/87 | 0 |
| 08/87 | 0 |
| 07/87 | 2 |
| 06/87 | 0 |
| 05/87 | 0 |
| 04/87 | 0 |
| 03/87 | 0 |
| 02/87 | 0 |
| 01/87 | 0 |
| 12/86 | 0 |

TABLE A-10

42166003 LEG, ZPL

| ORDER TIME | | | | | |
|---|---|---|---|---|---|
| LAST | 2ND LAST | 3RD LAST | 4TH LAST | 5TH LAST | AVERAGE |
| 5 | 11 | 5 | 0 | 0 | 7 |

| MONTH | USAGE |
|---|---|
| 11/89 | 1 |
| 10/89 | 0 |
| 09/89 | 0 |
| 08/89 | 0 |
| 07/89 | 0 |
| 06/89 | 1 |
| 05/89 | 0 |
| 04/89 | 0 |
| 03/89 | 1 |
| 02/89 | 0 |
| 01/89 | 0 |
| 12/88 | 0 |
| 11/88 | 0 |
| 10/88 | 0 |
| 09/88 | 0 |
| 08/88 | 0 |
| 07/88 | 0 |
| 06/88 | 0 |
| 05/88 | 0 |
| 04/88 | 0 |
| 03/88 | 0 |
| 02/88 | 0 |
| 01/88 | 0 |
| 12/87 | 0 |
| 11/87 | 0 |
| 10/87 | 0 |
| 09/87 | 0 |
| 08/87 | 0 |
| 07/87 | 2 |
| 06/87 | 0 |
| 05/87 | 0 |
| 04/87 | 0 |
| 03/87 | 0 |
| 02/87 | 0 |
| 01/87 | 0 |
| 12/86 | 0 |

TABLE A-11

427420002 SUPPORT. PACKAGE STOP

| ORDER TIME | | | | | |
|---|---|---|---|---|---|
| LAST | 2ND LAST | 3RD LAST | 4TH LAST | 5TH LAST | AVERAGE |
| 7 | 24 | 23 | 0 | 0 | 18 |

| MONTH | USAGE |
|---|---|
| 11/89 | 0 |
| 10/89 | 0 |
| 09/89 | 0 |
| 08/89 | 0 |
| 07/89 | 0 |
| 06/89 | 0 |
| 05/89 | 0 |
| 04/89 | 0 |
| 03/89 | 0 |
| 02/89 | 0 |
| 01/89 | 0 |
| 12/88 | 0 |
| 11/88 | 0 |
| 10/88 | 0 |
| 09/88 | 0 |
| 08/88 | 0 |
| 07/88 | 0 |
| 06/88 | 0 |
| 05/88 | 0 |
| 04/88 | 0 |
| 03/88 | 0 |
| 02/88 | 0 |
| 01/88 | 0 |
| 12/87 | 0 |
| 11/87 | 0 |
| 10/87 | 0 |
| 09/87 | 0 |
| 08/87 | 0 |
| 07/87 | 0 |
| 06/87 | 0 |
| 05/87 | 0 |
| 04/87 | 0 |
| 03/87 | 0 |
| 02/87 | 0 |
| 01/87 | 0 |
| 12/86 | 0 |

TABLE A-12

427420028 SPACER,

| ORDER TIME | | | | | |
|---|---|---|---|---|---|
| LAST | 2ND LAST | 3RD LAST | 4TH LAST | 5TH LAST | AVERAGE |
| 0 | 0 | 32 | 0 | 0 | 32 |

| MONTH | USAGE |
|---|---|
| 11/89 | 0 |
| 10/89 | 0 |
| 09/89 | 0 |
| 08/89 | 0 |
| 07/89 | 0 |
| 06/89 | 0 |
| 05/89 | 0 |
| 04/89 | 0 |
| 03/89 | 0 |
| 02/89 | 0 |
| 01/89 | 0 |
| 12/88 | 0 |
| 11/88 | 0 |
| 10/88 | 0 |
| 09/88 | 0 |
| 08/88 | 0 |
| 07/88 | 0 |
| 06/88 | 0 |
| 05/88 | 0 |
| 04/88 | 0 |
| 03/88 | 0 |
| 02/88 | 0 |
| 01/88 | 0 |
| 12/87 | 0 |
| 11/87 | 0 |
| 10/87 | 0 |
| 09/87 | 0 |
| 08/87 | 0 |
| 07/87 | 0 |
| 06/87 | 0 |
| 05/87 | 0 |
| 04/87 | 0 |
| 03/87 | 0 |
| 02/87 | 0 |
| 01/87 | 0 |
| 12/86 | 0 |

TABLE A-13

429810036 SPROCKET, ROLLER

| ORDER TIME | | | | | |
|---|---|---|---|---|---|
| LAST | 2ND LAST | 3RD LAST | 4TH LAST | 5TH LAST | AVERAGE |
| 7 | 7 | 7 | 16 | 8 | 9 |

| MONTH | USAGE |
|---|---|
| 11/89 | 0 |
| 10/89 | 0 |
| 09/89 | 0 |
| 08/89 | 0 |
| 07/89 | 28 |
| 06/89 | 0 |
| 05/89 | 0 |
| 04/89 | 0 |
| 03/89 | 8 |
| 02/89 | 0 |
| 01/89 | 0 |
| 12/88 | 18 |
| 11/88 | 0 |
| 10/88 | 0 |
| 09/88 | 6 |
| 08/88 | 0 |
| 07/88 | 0 |
| 06/88 | 0 |
| 05/88 | 0 |
| 04/88 | 6 |
| 03/88 | 0 |
| 02/88 | 0 |
| 01/88 | 0 |
| 12/87 | 0 |
| 11/87 | 5 |
| 10/87 | 0 |
| 09/87 | 0 |
| 08/87 | 0 |
| 07/87 | 0 |
| 06/87 | 0 |
| 05/87 | 0 |
| 04/87 | 0 |
| 03/87 | 0 |
| 02/87 | 0 |
| 01/87 | 0 |
| 12/86 | 0 |

TABLE A-14

# APPENDIX II

M.A.P.S.
MACHINE ASSEMBLY & PARTS SUPPLY
P.O. Box 7188 · Madison, Wisconsin 53707 · Telephone 608-241-3311 · Fax 608-241-6994

TO: All Oscar Mayer M.A.P.S. Suppliers

FROM: Kenneth J. Mepham
Oscar Mayer M.A.P.S. Division

Dear Supplier:

Oscar Mayer M.A.P.S. Division will be initiating a Supplier Certification Program in the near future. This program will be of mutual benefit to both Oscar Mayer and your organization if we continually work together towards zero defects.

The program is aimed at having our suppliers working towards defect prevention rather than defect detection.

Enclosed you will find a copy of our Supplier Quality Profile which will be used during our Quality audit with you. We encourage you to audit yourselves before Oscar Mayer reviews your quality status. You will be contacted in the first quarter of 1990 to setup a time in which we can together review your future quality goals and procedures. The program will be discussed in detail during our visit.

Until you become a certified Oscar Mayer supplier, we are still requiring 100% inspection and documentation of all parts shipped to us. Any parts arriving without completed inspection reports, or material certifications and corrective action reports (when applicable), will not be accepted at our receiving docks.

We are looking forward to a bright future working together with our suppliers who are committed to a solid quality program.

If you have any questions, please feel free to call me at (608) 241-6919.

Sincerely,

Kenneth J. Mepham
Quality Assurance Manager

M.A.P.S.
MACHINE ASSEMBLY & PARTS SUPPLY
P.O. Box 7188 · Madison, Wisconsin 53707 · Telephone 608-241-3311 · Fax 608-241-6994

## SUPPLIER QUALITY PROFILE

This survey applies to all Oscar Mayer Foods Corporation M.A.P.S. Division suppliers.

The purpose of the survey is to gather information relative to the supplier's capabilities to conform to Oscar Mayer Foods Corporation quality requirements.

Quality surveys of current vendors will be conducted on an annual basis. Quality surveys of potential suppliers will be conducted prior to issuance of a purchase order for services. All suppliers will be notified in advance of an upcoming quality survey.

**SUPPLIER'S NAME:** ____________________

**SUPPLIER'S ADDRESS:** ____________________

____________________

**TYPE OF SUPPLIER:** ____________________

| Supplier Contact | Title | Phone# |
|---|---|---|
| | | |
| | | |

**TYPE OF SURVEY:** original ☐ re-evaluation ☐

last date surveyed ___/___/___ next survey due ___/___/___

**SUPPLIER MEETS OR EXCEEDS THE FOLLOWING STANDARDS:**

*_____ **_____ ***_____ ****_____ *****_____

- * = Must be met to do business with Oscar Mayer M.A.P.S. Division.
- ** = Should be obtained within 6 months of meeting * category standards.
- *** = Must be met to obtain certification status. Should be obtained within 6 months of meeting ** category standards.
- **** = Preferred status
- ***** = Elite status
  (*** level is required to become a certified vendor.)

**SURVEY COMPLETED BY:**

O.M. representative: ____________________ ___/___/___

Vendor representative: ____________________ ___/___/___

____________________ ___/___/___

____________________ ___/___/___

POST SURVEY COMMENTS:

## SECTION I QUALITY ASSURANCE

| | | | yes | no |
|---|---|---|---|---|
| * | 1) | Are goals, objectives, and implementation dates established in writing? (if so, get a copy) | ☐ | ☐ |
| ** | 2) | Does quality personnel have the responsibility and authority to investigate and solve quality problems? | ☐ | ☐ |
| ** | 3) | Is an authorized material movement system in effect? | ☐ | ☐ |
| ** | 4) | Does the quality program include total organizational commitment to continually improve processes and systems? | ☐ | ☐ |
| *** | 5) | Is there a documented quality control manual defining the quality assurance system and quality procedures in effect? | ☐ | ☐ |
| *** | 6) | Is the Quality manual currently available for review? | ☐ | ☐ |
| *** | 7) | Is the manual periodically reviewed and revised? | ☐ | ☐ |
| *** | 8) | Is an organization chart included in the manual? | ☐ | ☐ |
| *** | 9) | Is there a documented corrective action system in effect? | ☐ | ☐ |
| **** | 10) | Does the quality manual have a controlled distribution? | ☐ | ☐ |
| **** | 11) | Is there a job related continuing education program in effect for all employees? | ☐ | ☐ |
| **** | 12) | Are quality levels monitored by regular documented reports? | ☐ | ☐ |

Comments:________________________________________

## SECTION II DRAWING AND SPECIFICATION CONTROL

| | | | yes | no |
|---|---|---|---|---|
| * | 1) | Is a documented print control system or procedure in effect? | ☐ | ☐ |
| * | 2) | Does the print control system prevent the use of obsolete drawings? | ☐ | ☐ |
| * | 3) | Are revision letters used on all appropriate documents? | ☐ | ☐ |
| * | 4) | Does the print control system have a procedure for updating changes to their suppliers of materials and services? | ☐ | ☐ |

Comments:______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

---

## SECTION III SUPPLIER CONTROL

| | | | yes | no |
|---|---|---|---|---|
| ***** | 1) | Does the vendor have a written supplier evaluation program? | ☐ | ☐ |
| ***** | 2) | Are supplier quality audits on file? | ☐ | ☐ |

Comments:______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

---

## SECTION IV MATERIAL CONTROL

| | | | yes | no |
|---|---|---|---|---|
| * | 1) | Is a stock identification system in use? | ☐ | ☐ |
| * | 2) | Is a stock traceability system in use? | ☐ | ☐ |

Comments:______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

SECTION V **STATISTICAL PROCESS CONTROL**

| | | | yes | no |
|---|---|---|---|---|
| ***** | 1) | Does the vendor have evidence of a sound SPC program? | ☐ | ☐ |
| ***** | 2) | Is there a on-going employee training program in SPC? (how many have completed the course?__________) | ☐ | ☐ |
| ***** | 3) | Are process capability studies used? | ☐ | ☐ |
| ***** | 4) | Are adequate charting techniques used? | ☐ | ☐ |
| ***** | 5) | Do SPC reports of part quality accompany each shipment of parts when applicable? | ☐ | ☐ |
| ***** | 6) | Are machine capability studies used? | ☐ | ☐ |

Comments:________________________________________

---

SECTION VI **INSPECTIONS**

A. RECEIVING INSPECTION

| | | | yes | no |
|---|---|---|---|---|
| * | 1) | Are certification documents on file covering purchased material where required? | ☐ | ☐ |
| * | 2) | Is all necessary paperwork, drawings and specifications available to receiving inspection to assure adequate inspection on incoming items? | ☐ | ☐ |
| ** | 3) | Is there a segregated area designated for non-conforming incoming material and parts? | ☐ | ☐ |

Comments:________________________________________

## B. IN-PROCESS INSPECTION

| | | | yes | no |
|---|---|---|---|---|
| * | 1) | Is a system established and in use that requires inspection of first piece parts and re-inspection if there is a change in process during manufacture? | ☐ | ☐ |
| * | 2) | Are all necessary drawings, specifications, etc., available to make necessary inspections? | ☐ | ☐ |
| * | 3) | Are parts in process in the manufacturing area positively identified as acceptable or unacceptable? | ☐ | ☐ |
| * | 4) | Are repaired or reworked parts or assemblies subject to the same quality procedures as normal work? | ☐ | ☐ |
| * | 5) | Do you feel that the vendor's in-process inspection system is adequate to assure that parts meet OMF quality standards and specifications? | ☐ | ☐ |
| * | 6) | Are parts inspected after they are received back from a subcontracted supplier? | ☐ | ☐ |
| ** | 7) | Are the first piece part inspections done by quality control personnel? | ☐ | ☐ |
| ** | 8) | Is inspection personnel coverage adequate? | ☐ | ☐ |
| **** | 9) | Are inspection instruction sheets used? | ☐ | ☐ |

Comments:________________________________________

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## C. FINAL INSPECTION

| | | | yes | no |
|---|---|---|---|---|
| * | 1) | Is a system established and in use that requires a final inspection or review of parts or in-process inspection reports before parts are assembled or shipped to customer? | ☐ | ☐ |
| * | 2) | Are all necessary drawings, specifications, etc., available to make necessary inspection or reviews? | ☐ | ☐ |
| * | 3) | After final inspection or review, are parts positively identified as acceptable or unacceptable? | ☐ | ☐ |

| | | | | |
|---|---|---|---|---|
| * | 4) | Is packaging and labeling inspected before shipment? | ☐ | ☐ |
| * | 5) | Do you feel that the vendor's final inspection system is adequate to assure that parts meet OMF quality standards and specifications? | ☐ | ☐ |
| ** | 6) | Are the final inspections or reviews made by quality control personnel? | ☐ | ☐ |
| ** | 7) | Are traceable records kept on final inspection? | ☐ | ☐ |

Comments:____________________________________________

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SECTION VII **NON-CONFORMANCE**

| | | | yes | no |
|---|---|---|---|---|
| ** | 1) | Is a system established and in use that requires all non-confirming material or specifications to be positively identified and segregated from normal production until a documented disposition is made? | ☐ | ☐ |
| ** | 2) | Is a corrective action system established and in use that reviews all non-conformances and takes positive documented action to assure that the non-conformance does not repeat? | ☐ | ☐ |
| ** | 3) | Are all non-conformance and corrective actions reviewed by management? | ☐ | ☐ |

Comments:____________________________________________

## SECTION VIII CALIBRATION

| | | | yes | no |
|---|---|---|---|---|
| * | 1) | Does vendor have a set of standards that are in calibration and traceable to the National Bureau of Standards? | ☐ | ☐ |
| * | 2) | Do you feel that the vendor's gage control system is adequate? | ☐ | ☐ |
| ** | 3) | Are written procedures maintained for the calibration and recall of test and inspection equipment? | ☐ | ☐ |
| ** | 4) | Are records of all calibrations recorded and maintained, including calibrated date, next calibration date, and inspector who performed the calibration? | ☐ | ☐ |
| ** | 5) | Is equipment marked with identification that allows traceability to calibration records? | ☐ | ☐ |
| ** | 6) | Is personally owned equipment included in the calibration procedure? | ☐ | ☐ |
| ** | 7) | Is production inspection equipment included in the calibration procedure? | ☐ | ☐ |
| ** | 8) | Is new equipment or equipment with past due calibrations impounded until calibrations are completed? | ☐ | ☐ |
| ** | 9) | Do gage inspection and maintenance records indicate an effective gage control program? | ☐ | ☐ |
| *** | 10) | Does vendor audit their supplier's calibration procedures? | ☐ | ☐ |
| *** | 11) | Are separate areas maintained for calibration and storage of inspection equipment? | ☐ | ☐ |

12) How often are gages, fixtures, and/or special instruments calibrated? ____________________

Comments: ________________________________________________

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SECTION IX **DOCUMENTS AND RECORDS**

| | | | yes | no |
|---|---|---|---|---|
| | 1) | Do inspection records contain the following: | | |
| * | | a) Part number | ☐ | ☐ |
| * | | b) Inspection date | ☐ | ☐ |
| * | | c) Quantity ordered | ☐ | ☐ |
| * | | d) Number of parts inspected | ☐ | ☐ |
| * | | e) Number of parts non-conforming | ☐ | ☐ |
| * | | f) Identity of inspector | ☐ | ☐ |
| ** | | g) Disposition of non-conforming parts | ☐ | ☐ |
| *** | | h) Corrective action recommendations | ☐ | ☐ |
| *** | | i) Corrective action taken | ☐ | ☐ |
| ** | 2) | Are inspection reports kept on file? | ☐ | ☐ |
| ** | 3) | Are material certifications kept on file? | ☐ | ☐ |
| ** | 4) | Are records available for OMF review? | ☐ | ☐ |

Comments:______________________________________________

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SECTION X **FACILITIES**

| | | | yes | no |
|---|---|---|---|---|
| * | 1) | Is the quality control area adequate to perform the required inspections? | ☐ | ☐ |
| *** | 2) | Is a special designated area maintained for storage and calibration of gages, measuring and test equipment? | ☐ | ☐ |
| **** | 3) | Is the vendor's quality system computerized? | ☐ | ☐ |
| **** | 4) | Is the vendor's SPC system computerized? | ☐ | ☐ |

Comments:______________________________________________

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_______________________________________________________

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# APPENDIX III

*Figure 1*

| Lead Time Variability | | Control Stage | | |
|---|---|---|---|---|
| | | Materials Planning | Order Release | Shop Floor |
| *Low* | Pull: Continuous Flow | **JIT(1)** | **Rate-Based(2)** | **JIT-Pull(3)** |
| | Hybrid Push-Pull Batch, Repetitive | **JIT-MRP(4)** | **Pull or MRP(5)** | **Pull(6)** |
| | Hybrid Push-Pull Batch, Dynamic | **MRP(7)** | **MRP(8)** | **Pull or Order Scheduling(9)** |
| *Hi* | Push: Custom Engineering | **MRP(10)** | **Order Scheduling(11)** | **Operation Scheduling(12)** |

*Used with permission, Uday Karmarkar, 1989*
*September-October, Harvard Business Review*

## Tailored Production Controls

Figure 1 (cont.)

Continuous Flow: The production process is dedicated to one or a few similar products. Production is continuous and level so that lead time for production is uniform and predictable. Some examples are assembly line, transfer lines, and dedicated flow lines.

1. Since production rates are uniform and predictable, material can be delivered to the process in a JIT manner.

2. Work orders are not required since production is level. A blanket order specifying a "going rate" is adequate. Occasionally, if the production mix is changed, the rates may be changed, but these changes are infrequent.

3. The predictability of the process and the production rate make it possible to design for smooth JIT materials flow on the shop floor. If there are points at which small inventories are accumulated for quality control or accounting purposes, they can be replenished in a pull manner.

Batch, Repetitive: Parts of the process may resemble a continuous flow system while others involve multiple products produced in batches. Lead times are fairly constant and predictable. The product mix is relatively constant but may have variations from month to month. Typical is production of parts and components for a high volume end product - such as cars or electronics.

4. Some parts and materials that are used uniformly can be delivered in a JIT manner. In other cases, with long lead time items, MRP is required to plan purchasing, delivery, and coordination between plants.

5. Since lead times are predictable, MRP works well, but so do pull methods - and they are cheaper. MRP may be required for master scheduling when work orders are generated, inventory must be managed, and work centers must coordinate.

6. Work on the shop floor flows relatively smoothly and pull systems can be used to move work on the shop floor. If MRP systems are used, the trick is to coordinate pull on the floor with MRP work orders. Tandem hybrid systems work well.

Batch, Dynamic: Production is in batches, and the output mix in volume can vary; many customers come in with their orders on a weekly and monthly basis. The load on the facility changes; bottlenecks can shift, with backlogs appearing here and there; lead times become variable. Examples are parts and product manufacturers supplying several customers, factories supplying retail outlets with multiple parts, and medium and low volume plants.

7. As production mix and volumes change, many different materials and parts are required, departments must coordinate production. MRP becomes essential to match purchasing with production and coordinate parts fabrication and assembly. Production volumes can be smaller than lots likely to be purchased, inventories build up and must be tracked.

8. Output varies too much for pull systems to work well. Look ahead, and build what will be needed. Even if MRP's timing isn't perfect, it does all the bookkeeping on quantities, inventory availability, and requirements, net of inventories.

9. At the shop floor level, work orders must be tracked. In some early common operations such as metal pressing, blanking, or molding, volumes may be high enough and level enough to use a pull system. Work orders, generating a master schedule, tie together purchasing, parts, subassemblies, assemblies, and customers orders. All are "pegged" and tracked with an MRP system.

Custom Engineering: With low-volume, complex engineered products or with custom manufacturing there is no regularity in production patterns. The load on the facility can vary widely; what took two weeks when ordered in January might take four months in June. Queues and congestion are a major concern, and lead-time management requires a high level of analysis and detail. Examples of such facilities are machine tool manufacturers, custom-equipment builders, and products with a high option and custom content.

10. There is no regularity in materials usage, some materials may be ordered only after a customer order is received. MRP is invaluable as an information management tool. It looks, orders, maintains bills, whether custom or standard, and coordinates customer orders, shop orders, and purchasing orders.

11. The factory runs on work orders generated by MRP. But MRP's poor understanding of lead times and capacity limits means that the order releases are of little use for good time and delivery performance. MRP still plays a role, however, in maintaining information about materials and inventory availability and coordination between departments.

12. Scheduling systems (OPT, CLASS, MIMI) that can handle the complexity of detailed operational scheduling are only just appearing. They are too complex and costly for smaller shops.