

Got Too Much Inventory? How We Improved Inventory Performance

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ABSTRACT

This paper presents a brief case history of how a successful manufacturing company burdened with over \$50 million in inventory and struggling with two turns per year was able to quickly turn things around and dramatically improve its inventory performance. It explains the Inventory Quality Ratio (IQR) technique and how it was used by a management consultant to help us get a rapid inventory reduction. The IQR tools have since been deployed to all of the planner/buyers for their use in further reducing excess inventories and improving our inventory performance.

INVENTORY MANAGEMENT CHANGES

International Game Technology (IGT) is the world leader in the design and manufacture of casino gaming equipment. It has rapidly grown in sales revenue and market share. IGT would certainly be characterized as a very successful company in sales, profits and customer satisfaction but inventory has always been an issue with only two turns per year. For over ten years we had relied on traditional MRP systems to manage our inventories. As our markets evolved from high-volume/low-mix to low-volume/high-mix our inventories ballooned to an all time high level of over \$50 million and shortages were increasing exponentially.

In the past, several programs had been undertaken to remedy our inventory problems. Each one had achieved a degree of success but was quickly replaced with another when business conditions changed. The material planning group nicknamed these efforts the “program of the month” as management’s focus on inventory ebbed and flowed. This time we were committed to creating a long-term solution to our overall inventory problems and we had a specific short-term objective of reducing inventory levels by \$10 million before year-end — less than four months away.

After an internal review of policies and practices, IGT decided to retain a management consultant (R. Michael Donovan of Framingham, MA) to assist us in developing an approach for rapid inventory reduction that would also allow our flow production assembly operation to continue running smoothly. Following a brief diagnostic review of current processes, planning parameters and systems support, the consultant developed a plan that involved:

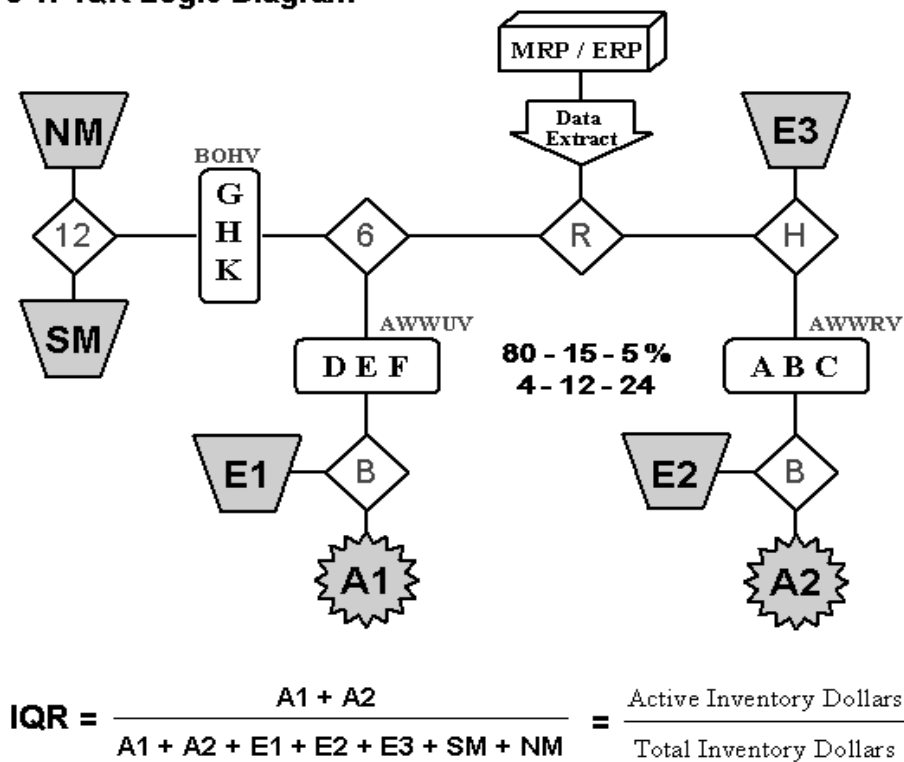
1. A number of inventory planning policy and practice changes.
2. A proactive philosophy of “prevent it before it happens” rather than reacting to negative consequences.
3. An inventory management technique called the Inventory Quality Ratio that embodied the first two principles and that he had used successfully at other companies.

We were fully expecting that major changes to our materials management philosophy would have to be made but at that point we were not looking for a software solution. Personally, I was very skeptical that any software tools or techniques were going to solve our inventory problems. As a materials professional I have come to learn some facts of life. When I was six years old I knew every television program, time and channel by heart. When I was 16, I was certain that I knew more than my parents. When I was 26 I knew that I was immortal. When I was 36 I knew that MRP was manufacturing's answer to everything. Now that I am almost 46 I know that I don't know everything.

THE INVENTORY QUALITY RATIO

The Inventory Quality Ratio is both an approach for managing inventory dollars and a new technique for measuring inventory performance. The IQR methodology was developed collectively by the materials managers of 35 companies. It was used by them to reduce inventories a total of \$500 million (25%) while improving on-time deliveries. It has since been used by planners, buyers and schedulers in other manufacturing companies to reduce inventories 20% to 40%.

Figure 1. IQR Logic Diagram



As shown in **Figure 1**, the IQR logic first divides inventory into three groups: items with future requirements, items with no future requirements but with recent past usage, and items with neither. The items in these groups are then stratified into typical ABC-type classifications using their future dollar requirements, their past dollar usage, or their current dollar balances, respectively. A target inventory level or rule is set for each item based on its classification. The balance on hand of each item is compared to the rule and the dollars of each item are categorized as either active (A1 or A2), excess (E1, E2 or E3), slow moving (SM) or no moving (NM). These are called the inventory quality categories.

The Inventory Quality Ratio is the ratio of the active inventory dollars to total inventory dollars. In a theoretically perfect situation (i.e., with no excess, slow moving or no moving inventories), the IQR would be 100%. Using nominal inventory rules of 4-12-24 weeks' supply for A-B-C items, respectively, our initial IQR in June 1998 was 30%. This meant that 30% of our inventory dollars were active and 70% were tied up in excess, slow or no moving items. Slow and no moving inventories amounted to nearly 10% of the dollars and one category, Excess 2 (E2), accounted for 50% of our total inventory dollars.

Although inventory turns is widely used as a measure of inventory performance, the calculation lumps all the inventories together and often hides the slow movers. Having five turns per year may mean that some items turned 30 times last year and some items haven't moved for several years. On the other hand, the IQR methodology examines every item in the inventory, compares it to dynamic target levels (based on future requirements or recent usage), prioritizes the exceptions based on the dollar impact, and provides performance ratios for each planner and segment of the inventory. Prioritizing our reduction opportunities proved to be the key to meeting our rapid inventory reduction objective.

INVENTORY REDUCTION TOOLS

Figure 2 provides a top-down look by inventory quality category of our purchased parts and manufactured inventories in thousands of dollars. This snap shot was taken by the consultant during his initial diagnostic review. We can drill down on any cell and see all of the part numbers that make up that dollar inventory sorted by the dollar amounts. We can also drill down on any item and see all of the detailed information for a given part number. Different views of inventory investment, similar to the make/buy breakdown in Figure 2, are also available by product line, planner, buyer, vendor, stock type, commodity code, ABC classification, storeroom and plant location.

Figure 2. Inventory Dollars by Quality Category -- Purchased and Manufactured

Quick Look Dollars (\$1000) by Purchased / Manufactured and Quality Category									
Purch Manu	Active 1	Active 2	Excess 1	Excess 2	Exces 3	Slow Moving	N Moving	Tota Value	IQR Ratio
P	35	16,99	4,09	26,87	0	1,73	3,40	53,45	32.4%
M	21	69	12	38	0	1	26	1,507	47.5%
Total	37	17,689	4,21	27,26	0	1,75	3,667	54,96	32.9%

In addition to measuring inventory performance, an underlying objective of IQR is to avoid the buildup of excess inventories that may become slow moving and no moving and eventually be written off. To that end, it identifies open orders for items where the on-hand balance is already greater than the target inventory level and prioritizes them by the dollars involved. The program also identifies potential shortages where the balance on hand is less than the rule and there are no open orders.

We can use our current Inventory Profile to simulate the impact of different material ordering guidelines on the inventory balances. Different scenarios in terms of safety stocks and ordering cycles can be evaluated off-line without the danger of changing current MRP settings. This has been a useful tool for setting realistic inventory reduction objectives for each planner/buyer.

There are many causes for the build up of excess inventories. As in most companies, only a few of these are under the control of the materials department. Many are the result of engineering changes, poor sales forecasts or production/scheduling problems. The Inventory Movement Matrix is a from-to chart that reports when an item of inventory has changed quality categories. This can be used to identify good and bad movement and to help determine the root causes of inventory buildup. When we have the facts and figures about the real reasons for bad inventory, we are better able to take corrective action.

A key factor in the success of our inventory reduction program has been the ability to write custom reports in IQR that quickly identify and sort reduction opportunities. Whether we are looking for safety stocks that are no longer appropriate to the level of usage, or open purchase orders for parts with no requirements, or parts that are due to be received long before they are needed, it is extremely easy for any planner/buyer to create a custom report for their specific question or concern.

RAPID REDUCTION PHASE

With senior management's objective of reducing inventories by \$10 million and little more than two months left in the fiscal year, the consultant used IQR to identify and prioritize the biggest opportunities for us to quickly reduce inventory dollars without creating more shortage situations. Interestingly enough, these were not with the Slow and No Moving items, but with the \$27 million of Excess 2 inventories. IQR provided the weeks supply information for our planner/buyers to monitor and adjust scheduled receipts dates based upon assembly requirements and the impact on inventory dollars. We were able to reschedule many high dollar receipts closer to their actual need date.

As the consultant explained, there are additional advantages to reducing Excess 2 inventories. Not only does it take inventory dollars off the balance sheet to increase turns and return on assets, but because these are parts that we are currently using it is also a dollar-for-dollar improvement in cash flow. And the less Excess inventory we have today, the less Slow and No Moving we are likely to have in the future.

During this initial rapid reduction phase, the consultant worked with us and showed how to use the information in IQR to adjust lot sizes and safety stock levels as well. When we first began using the tool we acted like the gorillas in the Jane Goodall *National Geographic* programs. Jane placed a stuffed animal out in the area where the gorillas frequented. When the stuffed animal was discovered by the gorillas they screamed, beat their chest, and cautiously walked up to touch the animal, always running back to the protection of the nearby undergrowth. We too approached IQR cautiously, often returning to the safety of what we had always known. Now that we have worked with IQR for a while we see it as a natural extension of our original MRP system.

In the two months prior to fiscal year end, the consultant helped us to reduce purchased parts inventories by over \$10 million, a 20% reduction. Over all, the reduction in total inventories in the five-month rapid reduction phase was \$16.4 million or 31.5% from 8/98 to calendar year end. Although the consultant and IGT management employed other approaches for reducing inventories, the majority of our reduction opportunities were identified and managed using the tools in IQR.

CONTINUING IMPROVEMENT PHASE

After several months of the consultant using IQR and in light of the results we had achieved, we decided this was not just a “program of the month” because the underlying principles of IQR had given us a new way to view inventory. Accordingly, we decided to make it available to our material planners and managers directly. In January we deployed the IQR tools to all of our planner/buyers and held formal training classes for them. This expanded their ability to use different parameters and material ordering guidelines. We also began importing the dynamic ABC classifications developed within IQR back into our MRP system so that our ordering policies remained current.

Based on the success of our initial efforts we also decided to expand the use of IQR to additional segments of our inventory that had been excluded from the rapid reduction phase because of their high mix and relatively low dollar volume. This addition actually doubled the number of inventory items being managed with IQR from 10,000 to 20,000 part numbers. It also increased our inventory dollars and decreased our IQR performance because these additional parts had not been previously managed. We consider the hiccup that this caused in our inventory performance tracking to be a temporary one and are more than willing to include the additional inventory items in a management tool that keeps us focused on the dollars, regardless of the type of inventory.

The continuous improvement approach that IQR recommends is very simple and is prefaced with a strong, practical suggestion. To avoid stalling out, the approach should be tailored to fit into the normal daily routine of the planner/buyers so that progress is made every week. The majority of the effort should be focused on a very few parts that will return the biggest results. We took this advice and started by attacking two or three parts per planner per week.

The first step is to stop the bleeding. With one of the standard tools in IQR we reviewed all Slow Moving and No Moving inventory that had open purchase orders. Within a two-day period, we were able to cancel or defer several hundred thousand dollars of material that was no longer needed. We also use IQR to review our open purchase orders every week and to identify parts with Excess inventory already on hand.

The second step is to clean up the inventories that have accumulated over years of neglect. Because we design all of our gaming machines we have a very high percentage of unique materials that no other company can use. We started looking at “trapped” material that could be reworked into something usable. We purchase large quantities of electrical components that could be sold back to brokers. We began that effort and have sold off another several hundred thousand dollars. Another technique we employed was to disassemble old product with return to stock components that still had requirements, and scrap the balance. We discovered that even though we had a reasonable Engineering Change Order process we often

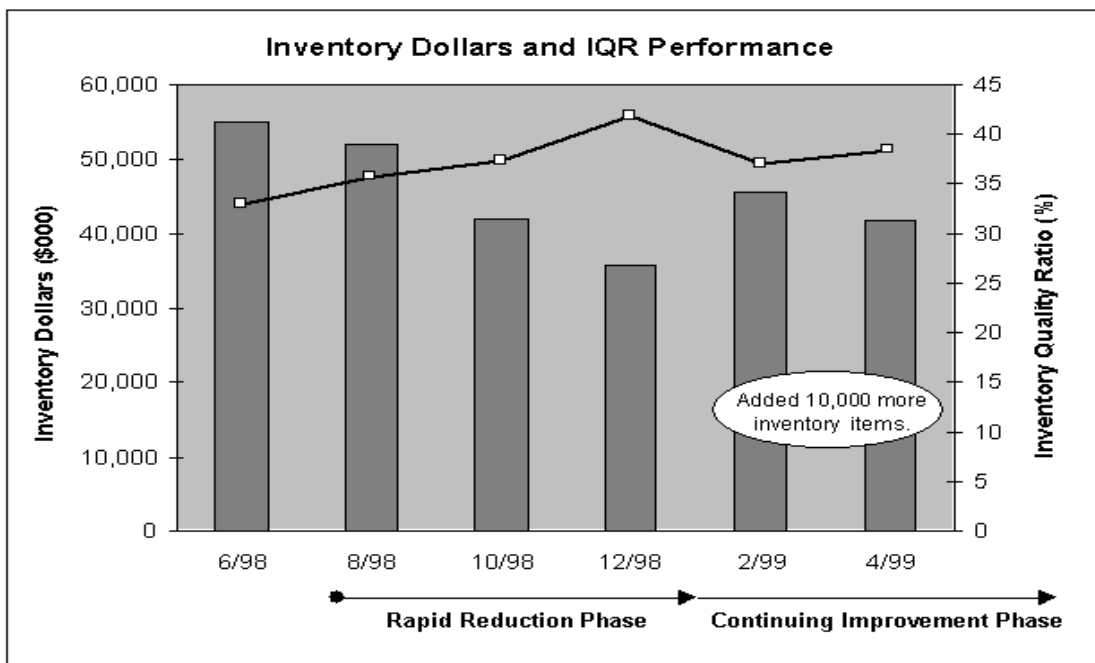
had obsolete inventory work its way back into stock. By using IQR regularly we began to catch this inventory and reroute it accordingly.

The third step is to take away the knife. This refers to managing the supply chain so that material flow into the plant was sequenced with the weeks supply recommendations from IQR. By changing our planning parameters in MRP to reflect the recommended weeks-supply rules in IQR we were able to change our delivery schedules with our suppliers. We now specify more frequent and smaller deliveries, which had driven inventory down. A critical part to making this work was to implement a policy of Material Ordering Guidelines. This document provides instruction on the use of planning parameters such as safety stock, over buys, lot sizing, and other factors that affect inventory levels. It further provides horizons that planner/buyers can use to make long-term commitments to our suppliers.

PROGRESS TO DATE SUMMARY

The graph in **Figure 3** shows the inventory reduction results and the increase in the IQR during both of the phases described above. A major part of the \$16.4 million reduction during the first phase was a 53% reduction in Excess 2 inventories, which had the additional advantage of improving cash flow by over \$14 million dollars. During this same period we were able to reduce both our balance on hand and our open order value for items without requirements by nearly 50%. Similarly, we managed to reduce the value of open orders scheduled to arrive early by 60%, and the value of open orders for excess inventory by 65%.

Figure 3. Inventory Reduction and IQR Improvement



Clearly the inclusion of 10,000 additional part numbers into our IQR-managed inventories in early 1999 has put a major dip in our inventory performance history. However, it was felt that if IQR could help us get the results we had been able to achieve to date that it only made sense to begin using IQR to help us manage all of our inventories. In essence we have defined a new starting point for our continuous improvement phase of inventory reduction.

After five months of rapid inventory reduction most of the low hanging fruit has been picked. We are only a few months into our continuous improvement phase but the results are encouraging. In the past ten weeks we have reduced inventory an additional \$3.8 million and have increased our IQR by 1.5% on a larger base. The IQR for “A” items has increased from 44% to 52%, “B” items have remained constant at 63%, and “C” items have improved from 46% to 49%. We have also been able to reduce late orders by 55% during this time. I am confident that our inventory performance will continue to improve and I look forward to showing you our latest results at the International Conference in October.

ABOUT THE AUTHORS

Richard Hardcastle is Manager of Material Planning for International Game Technology (IGT), a Reno, NV-based designer and manufacturer of gaming equipment. Prior to joining IGT in 1994, Richard was the Director of Consulting and Education for Data 3 Systems, an MRP II software developer. In this role he guided the development of the training programs and consulting standards for the company. He worked with and assisted over 200 customers with their MRP II implementations. Several dozen of these companies achieved Class A levels of performance. Prior to Data 3, Richard was a materials practitioner and successfully implemented a Class A system for a manufacturer of electric vehicles. Richard has attended several universities including the University of Riverside. He is certified CPIM by APICS and has held many board positions with the Redwood Chapter in Northern California.

Gary Gossard is President of IQR International, an Orange County, CA-based company providing management tools to the manufacturing and distribution industries. Prior to joining IQR International in 1992, Gary was the Chief Operating Officer of a high technology manufacturing company where he had overall responsibility for planning, procurement, manufacturing and finance. His previous experience also includes being a Partner in a “Big 6” CPA firm where he specialized in the operations and profit improvement of manufacturing companies. Gary is a graduate of the USC School of Engineering and the Stanford Executive Management Program. He first joined APICS in 1971 and has served on the Society Nominating Committee for the past three years. He is a Registered Professional Engineer and a frequent speaker at APICS, NAPM and various manufacturing industry conferences.
