Goldratt Institute℠
Focused System Improvement

Republic Industries International
Part I—The Journey Begins

Established in 1911, Republic Industries International repairs and produces large metal components supporting customers in the industrial and mining sectors. They also provide engineering services to develop unique solutions to meet customers' needs. Based in Louisville, Kentucky, Republic operates as a make-to-order and make-to-stock company with about 100 employees.

The Situation

When the new president contacted AGI-Goldratt Institute, he was uncertain about how, or if it was even possible, to apply the Theory of Constraints (TOC) Supply Chain Production Operations concepts to what was predominantly a repair business. However, he had no doubts about needing rapid and strategic improvement. Their costs were out of control, or at least that's what they believed. Their lost sales were increasing monthly as clients defected to their competition, citing lack of availability and poor due date performance. As their work-in-process continued to increase and consume operating cash, their ability to deliver finished components in time to meet customer demand continued to decline.

As is the case with many established companies with longstanding workflow traditions, Republic did not have a thorough understanding of how their company operated as system. AGI helped them analyze their current work and developed a detailed operational flow analysis to collect the data needed to make improvement decisions. The analysis pointed out a number of potential constraints. For example, nearly all of their work had to pass through a large stress relief furnace, which cost between $2K and $4K with each use, and thus implied some degree of batching. Another issue was some of their make-to-stock products required 'cores' that cost between $1K and $20K each—a significant expense for products with seemingly unpredictable demand. Having consumed their cash reserves, they frequently made scheduling decisions based primarily on the need to generate cash flow. For example, they would choose to repair a huge mining bucket (large enough to hold a small car as shown in figure 1), while sacrificing previous order promises that would generate less cash. To complicate things further, nearly every job was unique with the all the associated unknowns and variables of this type of repair business.

Figure 1. Large Mining Bucket Needing Repair

Strategic Business Solution

Based on the initial analysis, Republic chose AGI to help them develop a ***strategic*** business solution. After collecting a substantial amount of data and analyzing how the company was currently operating, they made some disturbing discoveries. For example, one product that only required 60 hours of actual hands-on work was averaging more than 11 months to be delivered. In addition to the

***VELOCITY*—a powerful business approach combining speed with direction**—consists of three pillars: **Theory of Constraints**, the system architecture; **Theory of Constraints Lean Six Sigma** (TOCLSS), the focused improvement process; and **SDAIS** (*Strategy-Design-Activate-Improve-Sustain*), the deployment framework.

analysis, AGI trained the management team in TOC supply chain principles and facilitated the ***design*** of a new operations management process using a TOC system perspective. They identified 25 obstacles and 12 potential negative consequences they had to address to ***activate*** the new process (see figure 2).

Largest obstacles:

- Changing the existing mindset
- Measuring efficiency and the negative behaviors those measurements encourage
- Lacking established communication procedures and the means to capture/share decisions
- Lacking appropriate customer requirements prior to job start, i.e., scope & due date; required materials; accurate documentation
- Scheduling based on cash situation, not the mix of work or impact on resources

Key potential negative consequences:

- Losing credibility if, after reprioritizing work, too many jobs are still a "rush"
- Cash constraints causing a lack of sufficient 'cores' to meet demand
- People feeling depressed/less important if they're no longer needed for 'firefighting"

Figure 2. Largest Obstacles & Key Potential Negative Consequences to Republic's Strategic Business Solution

Central to the ***strategy***, and consequent ***design***, were the TOC Supply Chain Management concepts of Market Demand-Pull and Buffer Management. Market Demand-Pull links the system's output to the customers' demand in the appropriate windows of time. Buffer Management protects the system's capacity to meet demand, both in time and in quantity. To improve their decisions about made-to-stock finished goods inventory levels, Republic used the ANALYZE capability of the AGI ***VELOCITY*** Suite™ to interpret historical and projected customer demand and anticipated production capacity. The ANALYZE capability provided the time and physical quantity buffer levels to establish their Market Demand-Pull system.

"We need more capacity!"

Within weeks of applying the first changes to their operations management process, they faced a crisis when half of their make-to-stock jobs (60/120) were late. After tossing blame back and forth, many believed they just didn't have enough capacity to produce what the schedule now required. Without cash or credit available to increase capacity, they were forced to re-examine some of their beliefs and assumptions identified in the original analysis.

During this re-examination, they recognized they had selected the easiest and least controversial changes as the first steps. They had not yet fully addressed some of the largest obstacles. For example, they realized nothing had really changed regarding their scheduling. They were still managing more than 400 jobs manually. They needed scheduling rules that the system could apply.

They learned even more about their conflict between the emphasis on local performance versus global (system) performance (see figure 3). Their policy of measuring local efficiencies had contributed to several unproductive behaviors that were previously undisclosed. They discovered, "If you measure me irrationally, expect me to behave irrationally. But don't be surprised if I do my best to hide these behaviors." To promote the "efficient" use of personnel and machinery, supervisors were assigning work to eliminate idle time by having workers (1) start a new job, (2) perform steps out of order (often creating re-work), or (3) mask idle hours in a large task regardless of their skill type.

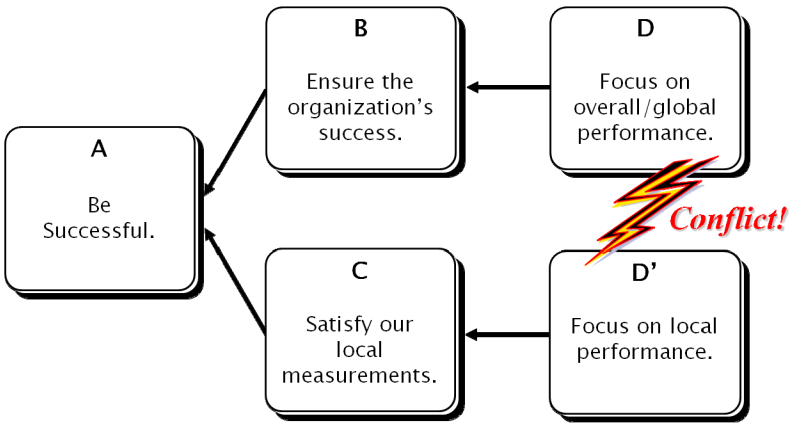

Figure 3. Organizational Management Conflict

Efficiencies were really high—even reported above 100%! But customers challenged the high fees caused by the rework and extraneous non-productive time. A number of jobs lost significant money. Republic saw how the conflict between local and global measures was limiting their ability to succeed.

Republic still had to overcome two of the largest obstacles: (1) lacking established communication procedures and (2) lacking appropriate information. In trying to determine why some jobs took so much time, management heard all sorts of excuses—the job was scoped wrong, we needed more people, we're waiting on a part, the time estimated was too short. The real truth was hard to find because without established communication procedures, no one documented the important conversations and decisions made along the way. Ultimately, some details were forgotten, and other people never received the information they needed. Sales had no established means to communicate with production managers about whether or not a job's due date was achievable. To make matters worse, they frequently lacked appropriate information. They often didn't know when a job was awarded, when it had arrived, or when the customer expected it. Improving their procedures and information management were vital steps in fully activating their solution.

Republic started by formalizing how information flowed from sales to production. Then without purchasing any additional software, they queried their enterprise resource planning system, applied logical analysis, sorted by due dates, and used the resulting information to generate the work schedule. Because of their operating cash constraint, scheduling had to be based on cash flow until that constraint no longer existed. They formed a scheduling group to assess the current and future work loads and the ability to complete work based on constrained resources. They manually adjusted work release only where necessary. The scheduling group relieved some senior management of their perceived need to manipulate work center operations and encouraged supervisors and workers to follow the desired behaviors. They reemphasized to their workers the importance of timely and correct updates to the enterprise resource planning system to provide meaningful information. They enabled their software to ask simple, unambiguous, "Are you done? Yes or No" questions. To solidify acceptance, they held employee meetings to emphasize the new procedures to account for employees' work time on tasks and that they were committed to a no-layoff plan. They held department supervisors accountable for accomplishing work based on the scheduling priorities list. They made it clear whom to contact if the job was showing up on the list, but not in their work area, thus creating a job pull system.

To ***activate*** these additional elements, Republic Industries set a date for the new communications and scheduling rules and behaviors to be in effect. During the first week, they held strong on not releasing new work when someone had nothing immediate to do (even with 120 jobs in queue for highly used resources). They gave timely feedback to people who either misunderstood or misapplied their roles or rules relating to the new desired behaviors. By the beginning of the next week, people had readily adapted to the new operations management process.

The Impact of Design and Activate

Based on their strategic direction and through the constraint-based system analysis, Republic Industries was able, in a relatively short time, to identify when and why the early activation steps of their designed solution hadn't gone far enough to genuinely change their performance and improve their operating conditions. After activating the additional elements, the supervisors were extremely pleased because they no longer found themselves breaking any setups or having to listen to several people telling them what to do next. They started to lend out idle employees to other departments that needed help, yielding a better-trained work force. With their enhanced system understanding, these workers identified and proposed several additional cross-functional improvements. Operating under the new rules stabilized their

operations and work environment.

Results!

Following ***activation***, they saw positive results quickly. The number of late jobs decreased from 60 to 20. In one month following activation, they were able to reverse the ratio of made-to-stock work-in-process and finished goods (see figure 4):

- Work-in process value decreased $481K to $290K (-40%)
- Finished goods value increased $353K to $449K (+27%)

However, the initial financial reports were ugly. Based on traditional cost accounting where work-in-process and unsold finished goods are considered assets, they appeared to have lost around $95K! (See Goldratt's *The Haystack Syndrome*, chapter 5 for more details on how traditional cost accounting distorts measures of plant performance based on changes in inventory. More discussion of Republic's move to throughput accounting is covered in their *Part II* case study.) Fortunately, AGI had prepared them for this scenario, and Republic had already discussed the possibility of paper losses with the bank. The genuine good news was their improved operations management process was transforming their capacity to be more responsive and timely in meeting customer demand.

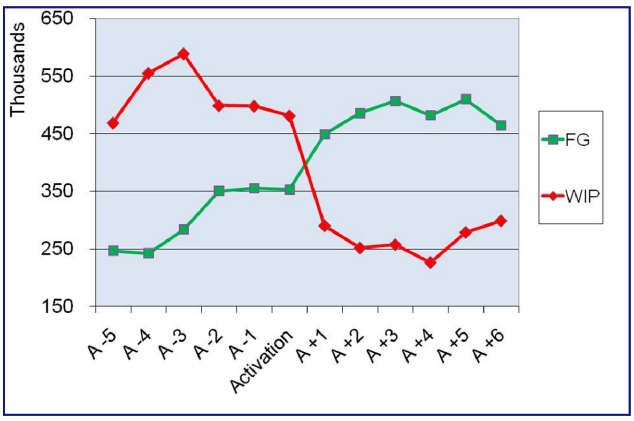

Figure 4. Value of made-to-stock work-in-process and finished goods before and after Activation

Figure 4 shows they successfully maintained the new ratio of their finished goods greater than their work-in-process for the months following activation. Comparing the six months before and after activation, the average end-of-month work-in-process value decreased 48%, while the average end-of-month finished goods value increased 58%.

This performance highlighted the increased velocity of work through their system to meet customer demand. Additional data supported this enduring growth, particularly in their made-to-stock sales. Figure 5 shows, in the 1ST and 2ND fiscal quarters after activation, seasonally adjusted sales increased 40% and 24% respectively over the previous year.

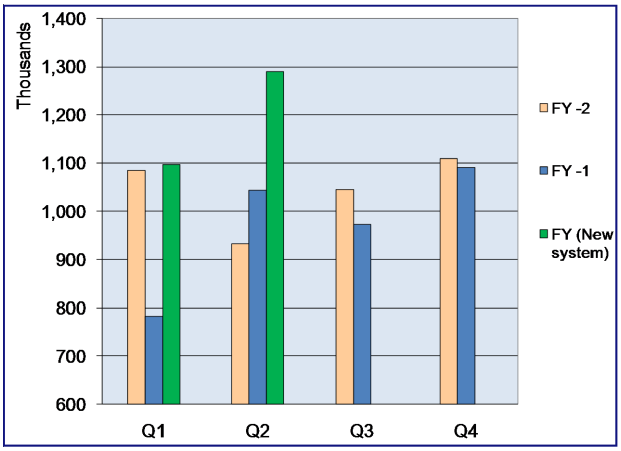

Figure 5. Value of quarterly made-to-stock sales before and after Activation

The Road Ahead: Focused System Improvement

Republic Industries International recognized their journey had only just begun. With all they had learned about their operations and the impact of their policies, measures, and behaviors, they saw the opportunity, and need, for ongoing cycles of Focused System Improvement.

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