

CAPSUGEL®

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Case Studies in Capsule Filling: Improving Efficiency, Performance and Profitability



ABSTRACT

The ground rules have changed for product development and production in the pharmaceutical and health and nutrition industries.

As both brand and generic companies in the pharmaceutical domain grapple with improving their new product pipelines and addressing the needs of new and emerging patient populations, these companies must also meet growing productivity demands in manufacturing.

The demand for speed-to-market in the health and nutrition industry has escalated, too, as growing numbers of consumers approach health care choices directly. Ever widening competitive selection and cost-containment demands by channels require manufacturing to maintain productivity while improving performance.

Because of these new ground rules, “cost leadership” has become the mantra of every manufacturing organization in the world of pharmaceutical and nutritional health companies. Historically, one primary focus of cost efficiency efforts has been to scrutinize the acquisition cost of raw materials. While this approach remains important, it does not often lead to sustainable cost leadership, particularly if lower cost materials result in compromises in manufacturing efficiency or product performance. Consequently, new approaches must include a “total cost in use” paradigm.

Capsugel, as the world’s premier supplier of empty capsules, has a unique perspective on this topic. Given the breadth and depth of our customer base, we have “manufacturing floor” experience

with the widest array of commercial capsule-filling equipment and the most extensive range of fill ingredients. As most filling room supervisors can attest, it is very difficult to achieve the highest rated speeds of modern manufacturing equipment with a sticky fill material with poor flow properties.

Nevertheless, manufacturing and profitability can be realized through the right combination of formulation, filling equipment and capsule. Optimizing manufacturing to fully exploit superior capsule integrity and consistency makes sense. Understanding the impact each has on the other helps prevent pitfalls during development and unlock pathways for greater efficiency – leading to greater profitability.

Discover profitability through the right combination of formulation, filling equipment and capsule and optimize manufacturing to fully exploit the superior capsule integrity and consistency.

Capsugel has developed a wide array of industry leading capsules in polymers designed to optimize formulation and run-ability performance. Capsugel Technical Service Engineers now routinely consult with customers on equipment purchase for fill products, process flow evaluations and operator training to complete the productivity loop. With that insight, Capsugel now proactively determines cost savings associated with recommended improvements using “Savings Reports” based on total cost-in-use.



The Fundamentals of Manufacturing Costs

Manufacturing costs are primarily driven by the cost of raw materials, product manufacturing time and expense, and the yield...the quantity of finished product as a function of the starting materials.

Raw material costs include the cost of materials – and the cost of testing the materials for identity, purity, safety, and effectiveness. Economies can be realized by consistently working with high quality reliable suppliers with a certified method for testing raw materials. Taking advantage of the qualified methods from a vendor can lead to reduced testing requirements. This can improve lead time performance, reduce required inventory levels and holding costs (taxes, insurance, etc.), and free up working capital.

CASE STUDY

Reduced Testing Savings Through Certified Vendors

When a large multi-national pharmaceutical company certified Capsugel as a vendor and took advantage of Capsugel's raw material testing services, the company realized significant, both initial and recurring, annual cost savings of \$119,405, including sample collection and preparation, testing expense, and inventory-related savings.



Speed vs. Yield – A New Capsule-Filling Paradigm

The old saying, “Time is money,” continues to apply in today’s demanding business environment. To deliver a finished good, a facility must pay for utilities and labor – costs that can fluctuate per quantity of product produced – along with fixed costs such as rent and insurance. The manufacturing cost of a product is less when more products can be manufactured with the same equipment and people as before. Note that time to manufacture can further be broken into two controllable variables of uptime and equipment throughput.

However, despite this connection between machine speed and manufacturing cost, yield improvements have been the primary target of capsule-filling operations. This is understandable in the world of capsule filling, as the fill material in the capsule accounts for most of the cost associated with an encapsulated product, not the empty capsule. Savings generated from yield improvements are the result of fewer losses to starting materials and the time and energy conserved in producing fewer filled capsules that cannot be sold. Consequently, even a small improvement in yield can have a financially significant impact.

In a review of more than 30 customer case studies in which Capsugel Technical Service Engineers worked to improve capsule-filling efficiency, approximately two-thirds achieved yield improvement rates in the range of an incremental 2 to 4%. While some improvements were delivered by more complex means, the majority were realized through focus on the education of personnel and maintenance of equipment.

CASE STUDY

The Financial Impact of Improving Yield

Company A was experiencing poorly joined capsules on their intermittent motion capsule-filling machine for one of its products. Internal inspections of the problem caused loss of production time and consistently low yield. Upon review by the Capsugel Technical Service Engineer, the setup of the closing station was targeted for improvement. The height of the counter bearing and timing of the movement was adjusted to correct the conditions causing poor joining of capsules. The adjustment resolved the issue. As a result, production downtime due to internal inspection was eliminated, yield was improved by more than 8%, and the company saved \$94,000 annually for production of this one product.

We tracked 30 customers involved in capsule-filling productivity improvements with the assistance of Capsugel Engineers and charted the cost savings of capsule filling productivity or efficiency based on costs associated with machine speed, yield, and downtime (see Figure 1). The average productivity savings of \$91,560 per company annualizes to a total combined aggregate savings of about \$2.747 million.

The combined savings exceeded the total money spent on empty capsules.

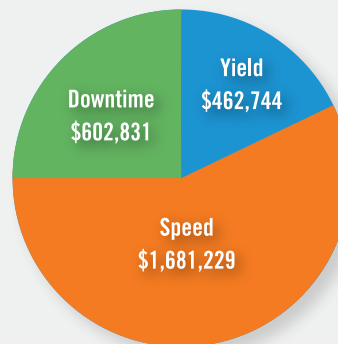
These dollar savings support the conclusion that improving capsule-filling efficiency is well worth the effort. The combined savings alone exceeded the total amount of money spent annually on the empty capsules in the managed projects. In particular, machine speed increases accounted for 61% of total combined financial impact. At the individual customer level, machine speed increases averaged approximately 14,000 capsules per hour.

The absence of faster throughput is often the by-product of other manufacturing circumstances as the following case study illustrates.

How Speed Improvements Influence Profits

In our studies, we also uncovered one not-so-obvious conclusion: the total cost/savings return associated with increasing machine speed was higher than that for yield increases.

Figure 1: Improving speed has a higher impact on savings than improving yield or reducing downtime. Breakdown of cumulative cost savings by Capsugel customers.



CASE STUDY

Speed

Company B invited Capsugel to assess its capsule-filling operation. Our Technical Service Engineer noted that the company was running below the rated speed of their capsule-filling machine. The limiting factor was the non-separation of capsules at higher speeds. Upon investigation, the engineer discovered that the vacuum pump was inadequately sized for separation of the capsules at the higher speed. Once corrected, the speed was increased by 83% resulting in a financial impact of \$365,000 annually.

Why is there such a large difference in realized savings when speed improves when compared to yield improvements? We believe that capsule filling machine speed is finally getting the long overdue attention that it deserves and companies are better understanding how to improve machine speed. Yield losses and their financial impact have routinely been a focus of manufacturing teams. As the subject of daily production meetings, yield losses are front and center with management. Machine speed compromises have tended to be more accepted remedy for yield loss, obscuring the real financial impact of running a machine below its capacity. Today, more companies are discovering how higher throughput can have a greater impact on a company's financials than demonstrated thus far. While greater throughput enables better use of variable labor and utility costs, it also gives a company greater manufacturing capacity within the same footprint. Maximizing available capacity enables growth without additional capital expenditures to purchase equipment.

Eliminating Downtime Improves Performance and Profitability

Our aggregate data also shows substantive savings related to improvements in downtime. However, these numbers reflect only a small number of instances in which downtime was reduced by 1 to 2 hours (per 8 hour shift basis) among our 30 cases and may not reflect the true potential future savings from continued consultation with our Technical Service Engineer team. In the following instance, the dramatic improvement in downtime was discovered through the application of preventative maintenance.

CASE STUDY

Downtime

Company C was plagued with excessive downtime on one particular sticky product. The Capsugel Technical Service Engineer listened as the company explained that due to the nature of the product, the segments had to be cleaned frequently to avoid issues with capsules fitting into the segments causing capsules not to separate. This resulted in significant delays. The Capsugel Technical Service Engineer designed and implemented an ejection brush cleaning system to remove build up while the machine was running. It greatly reduced the needed frequency for cleaning, resulting in \$32,000 in downtime savings annually for this product.

How Quality by Design Impacts Financials

Thinking and planning ahead during early setup stages can often achieve the best productivity results. Quality is built into a product by delivering the optimal set of circumstances to avoid problems during the process of delivering the product to the market. The concept, known as Quality by Design, is well known in quality improvement circles and is the foundation of Six Sigma methodologies. First pioneered by Joseph M. Juran, Quality by Design asserts that quality can be planned and that encountered problems are related to how the quality was planned from the beginning.

Understanding dosing options and powder characteristics can prevent pitfalls.

To achieve capsule-filling efficiencies via Quality by Design, there are various capsule-filling technologies and dosing styles available on the market to be considered. Each style has its own benefits and limitations. Manufacturing efficiency and profitability lie at the intersection of the formulation, equipment and the capsule. Understanding the different types of dosing options, and the powder characteristics that work best with each technology helps prevent potential development pitfalls. For example, a sticky powder that is hard to compact may not work well in a tamping technology. Sometimes powder flow characteristics may not match the equipment, and it may be necessary to apply Six Sigma standards to optimize the outcome as shown in the following case study.

CASE STUDY

Turning a Bitter Taste into a Tasty Profit

A manufacturer was receiving a growing number of consumer complaints about capsules that had a bitter taste. During manufacturing the capsules were joining poorly and the bitter powder was coating segments of the tamping machine, resulting in low yields. The root cause analysis showed a sticky and gritty powder that the machine was not adequately compacting for dosing. To achieve the desired fill weight, the capsules were filled beyond their capacity. The poorly formed slugs and undersized capsules resulted in powder loss into the segment which interfered with closing and left residual powder on the capsules resulting in the bitter taste.

Capsugel Technical Service Engineers improved the compaction by adjusting the equipment to form a better slug, thereby drastically reducing powder losses. As a result, the yield improved by 10% with less downtime for cleaning, and the speed of the equipment could be increased by 25% without sacrificing weight control. For the annual volume, the savings were nearly \$1 million and patient complaints dropped dramatically.



Measurement – Critical to Success

*"If you cannot measure it,
you cannot improve it."*

– Lord William Thomson Kelvin (1824-1907)

The famous Scottish mathematician and physicist Lord Kelvin expressed this universal truth for the sciences. But it also applies to business. Understanding how to measure the drivers of your business is a powerful tool for maximizing profit.

Capsugel can now provide a comprehensive capsule-filling efficiency “savings” report that calculates the total business impact based on specific improvements in capsule-filling machines and processes. It shows how an adjustment, a repair, or a replacement will affect speed, yield, downtime – and the bottom line (see Figure 2).

Historically, capsule-filling manufacturing metrics concentrated on machine-related end-points, such as minutes of downtime or pounds of waste at various parts of the machine. Now, by adjusting

these metrics to incorporate and demonstrate the associated real-world cost impact, our customers are better able to justify their remedies and plans. They are better equipped to build the business case necessary to obtain the resources and focus to drive productivity improvement in their capsule-filling operations. The following case study illustrates the point.

CASE STUDY

Return on Investment

Company D experienced various defects after encapsulation. Capsugel’s Technical Service Engineer quickly identified that the segments on the machine were excessively worn and needed replacement. He worked with the production team of the company and utilized Capsugel’s Capsule Filling Efficiency Report to show the complete financial benefit of replacing the worn segments. The financial impact of the losses far exceeded the cost of replacing the segments. Armed with the business case, the production team justified the cost of replacing the parts with their internal stakeholders.

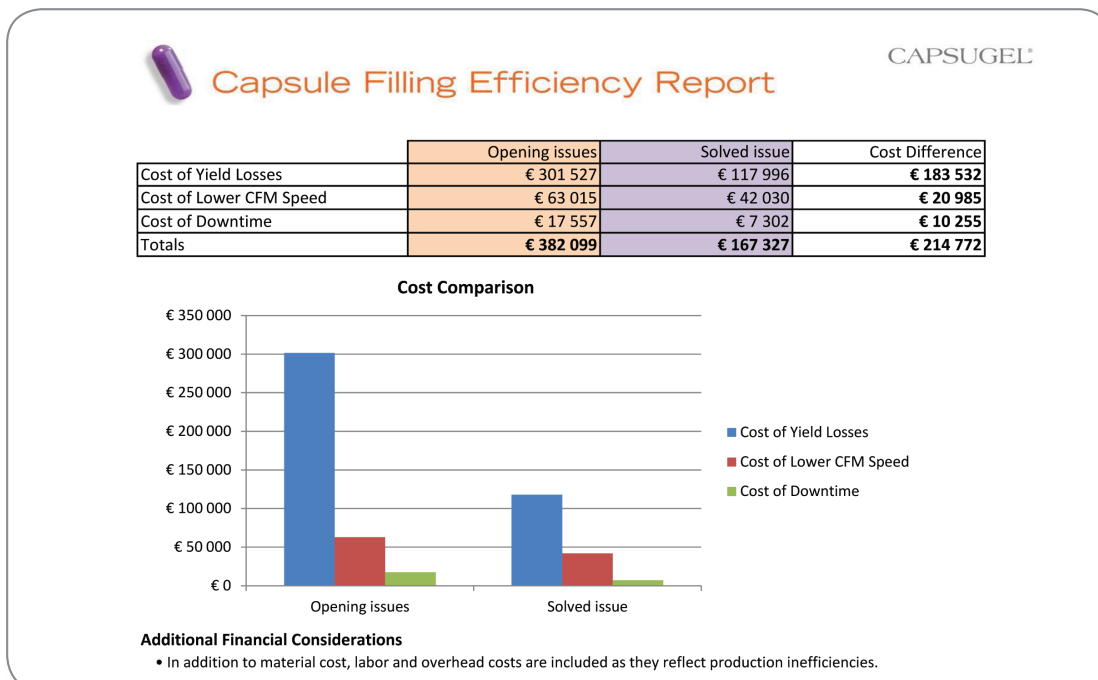


Figure 2: Example of Capsugel’s reporting tool for productivity improvement programs.

For more information call us at **888-783-6361**.

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