The Results Are In:
Verifiable Pouch Quality is Achievable

Abstract

CMD brand of pouch converting equipment replaces the 'art' of the pouch-sealing process with a reliable, repeatable sealing system: ***Intelligent Sealing Technology***. This technology, the only of its kind in the industry, solves a long-standing problem among pouch converters: how to statistically verify the seal quality on each and every pouch produced. The implications of solving this problem reach far and wide: verifiable product quality to customers; a massive reduction in scrapped product, leakers and defects, and the ability to make ***verifiable*** quality claims. Intelligent Sealing Technology uses in-process measurements to *monitor and maintain* the **key sealing process input variables of temperature, pressure, and time**. This closed-loop system not only maintains process control, it can also provide data output, for in-depth process analysis, with the addition of the CMD Insights data collection and analysis tool.

Introduction

CMD Corporation has developed Intelligent Sealing Technology for its entire pouch converting platform. This white paper will discuss how the technology works, and provide statistical evidence of its validity.

The Problem

At some point in our lives, we've all been the victim of a product that didn't deliver. We may have bought that product because of a high-energy, emotionally-charged sales-pitch; but when it came time for performance, the reality just didn't measure up to the hype. The key word here is 'measure'.

When it comes to selling pouches to brand owners and CPGs, *consistent quality* is the expectation. The consequences for delivering inconsistent quality include loss of revenue, cost of returned goods, high scrap costs, rework costs, loss of orders, and potential loss of customers. The stakes are high. Converters today employ a range of supplemental tools, from LEAN manufacturing practices to Statistical Process Analysis. And while these tools are valuable to help improve the process, they cannot control the precise sealing parameters for each pouch.

Data acquisition programs are widely available, and some pre-made pouch converting equipment can be programmed to "track" some of the sealing process data, which is fine for analysis after the fact. But these programs do not maintain product quality, they report it. They do not correct for variation, they observe it.

In order to provide consistent seal quality, you must first identify uncommon variation within the sealing process. You must then bring those sources of variation into control. These principles are at the heart of any world-class manufacturing operation. These principles are also at the heart of the new CMD Intelligent Sealing Technology for pre-made pouch converting.

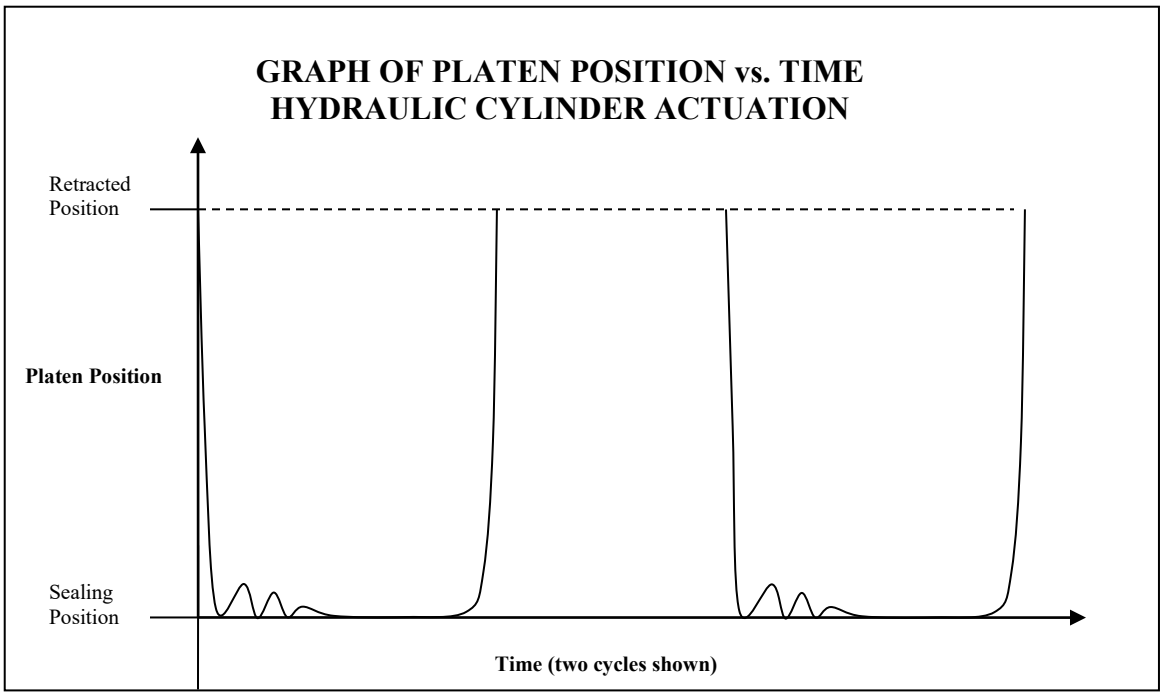
The Solution

Pioneered by Walter Shewhart, but made famous by W. Edwards Deming, Statistical Process Control has been the mathematical model by which manufacturers have been able to objectively identify, quantify and correct sources of variation within a process. CMD has used this same model to determine the effectiveness of Intelligent Sealing Technology. The remainder of this paper will discuss Intelligent Sealing Technology in terms of three Key Process Input Variables within the sealing process…Time (or Dwell), Temperature and Pressure.

Time:

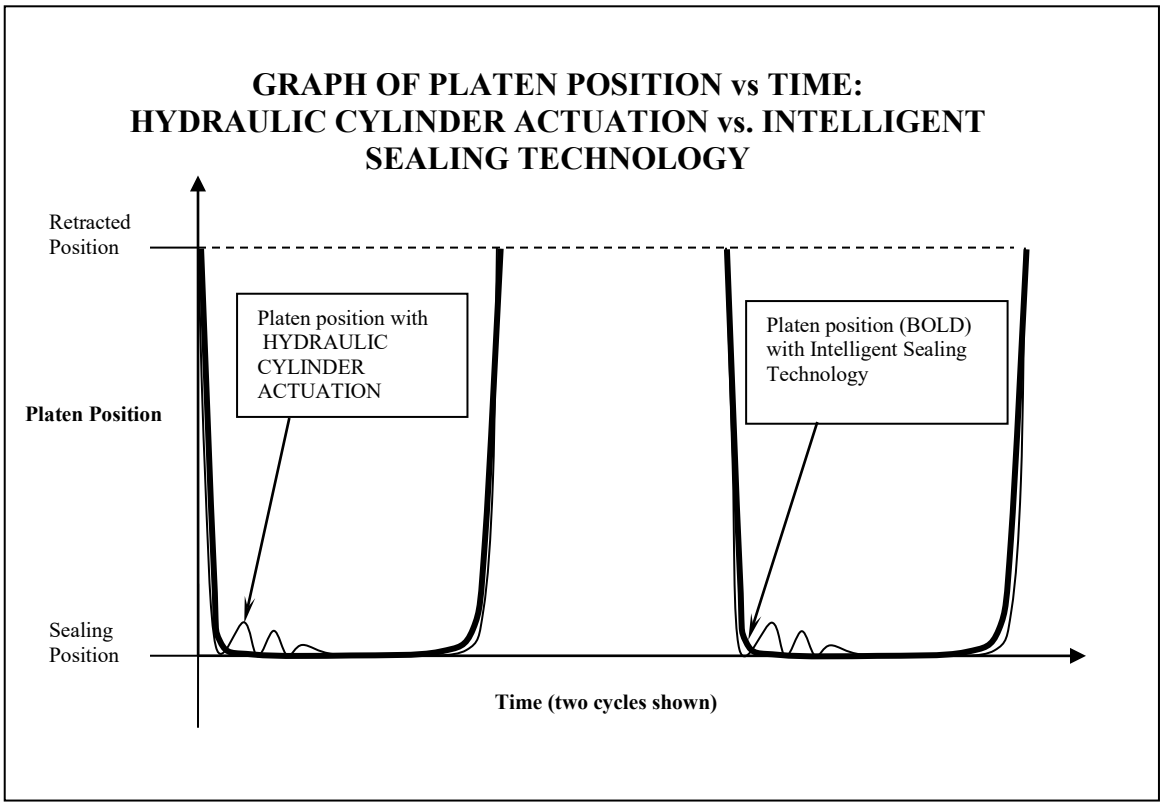
Process Driven Innovation has been the driving force behind each advancement made to the CMD pouch converting equipment, up to and including Intelligent Sealing Technology. Beginning with the factor of time, we will begin to show how the 'art' of heat-sealing substrates together has been replaced by an objective, measurable and controlled process.

We began by measuring the existing sealing methods available, whether they be actuated by hydraulics, pneumatics, or electronics. We found that the major source of variation in contact time was the compressibility of air and hydraulics, whether they were utilized on the actuating side of the mechanism, or on the base structure. This compressibility leads to instability of actual contact with the substrate, as indicated by the diagram below:



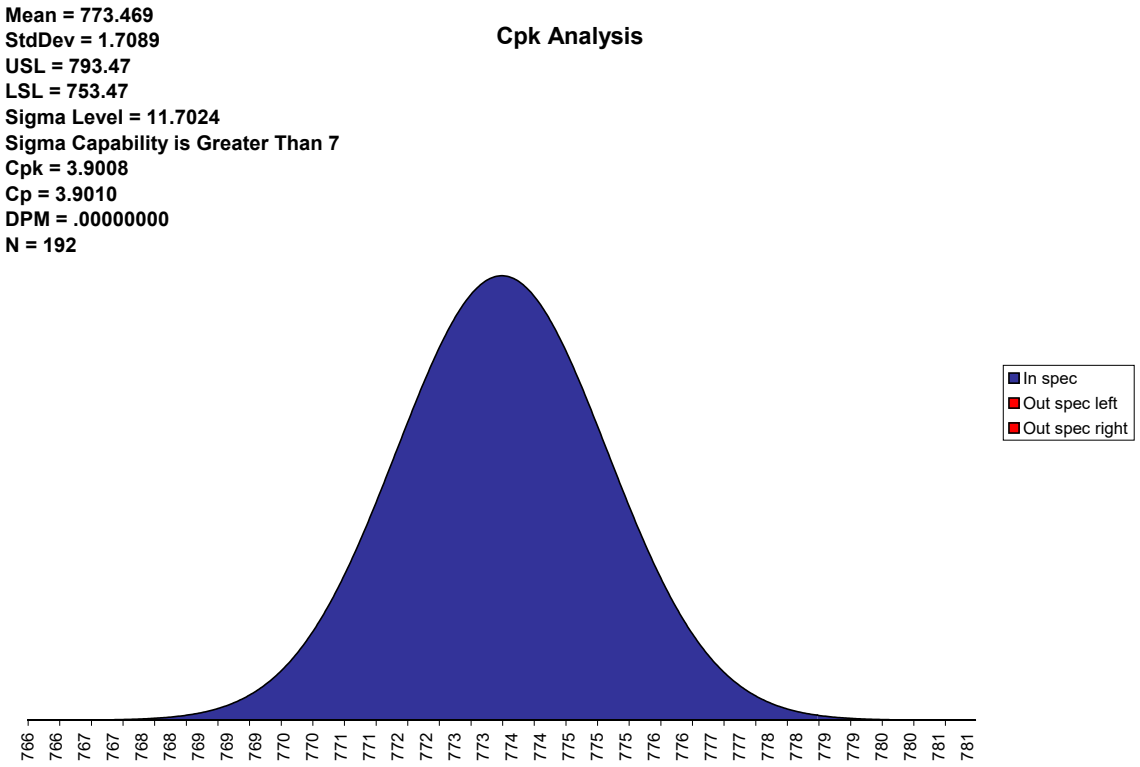
Here, you can see a ripple-effect of sorts in the actual measured dwell, or contact time. This 'ripple-effect' was a source of variation which needed to be controlled. This was done in two ways. First, a controllable actuation method was developed.

Replacing existing pneumatic or hydraulic actuation with electronic servomotors driving a sophisticated mechanical actuator allowed for a controllable and measurable actuation methodology. This was matched with a rigid-mounted base, or 'force-receiver'. Doing this allowed the velocity of the actuation to be controlled, which in turn managed the 'ripple-effect' and produced a consistent and measureable contact-time, as illustrated by the diagram below:



Time – continued:

CMD's ***Process Driven Innovation*** approach has lead to the fixed-base servo-actuated sealing methodology employed by Intelligent Sealing Technology, allowing accurate control and maximization of true contact dwell-time. We went a step further, and actually measured the contact-time achieved by this system and analyzed this data to determine the level of control we've achieved. The results are illustrated on the Cpk analysis shown in the following chart:

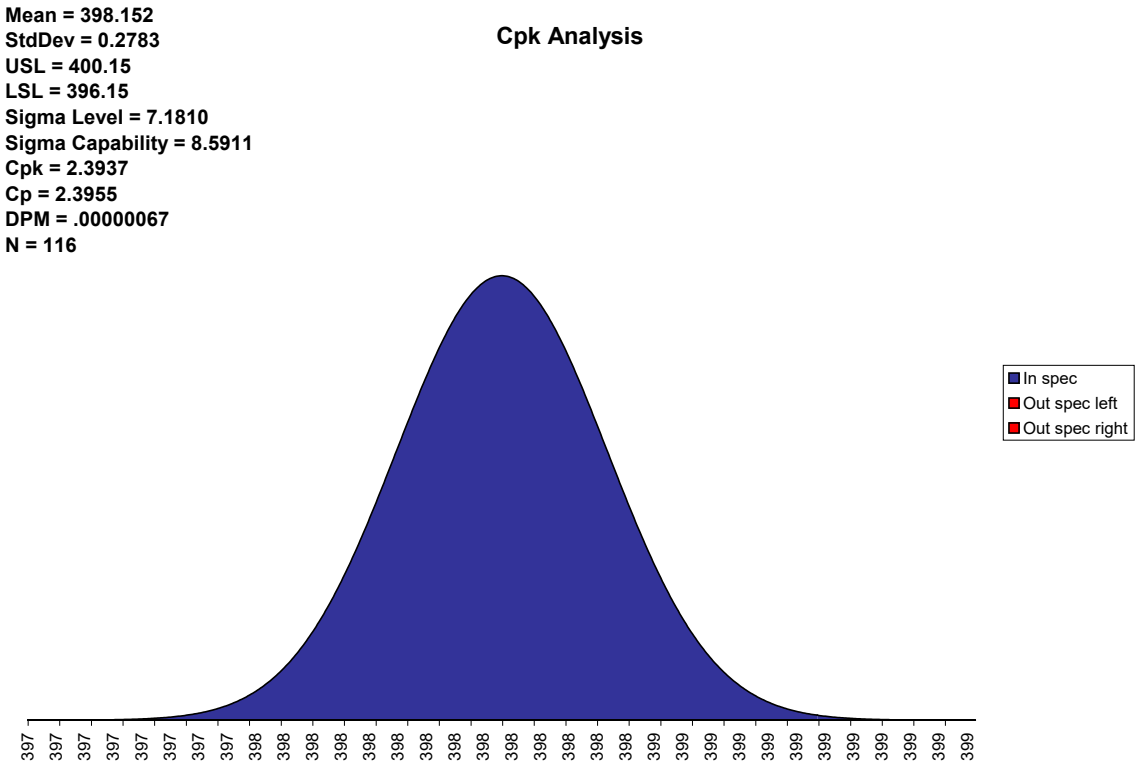


Temperature:

Arguably the most important factor in the time-temperature-pressure triad, precise control over this Key Process Input Variable has received attention by both OEM's and device manufacturers. For this reason, there are myriad solutions available to equipment manufacturers and converters.

The solutions available ranged anywhere from individual controllers wired to monitor and control each individual temperature zone; to fully integrated systems, using the main PLC to monitor and control the individual zones.

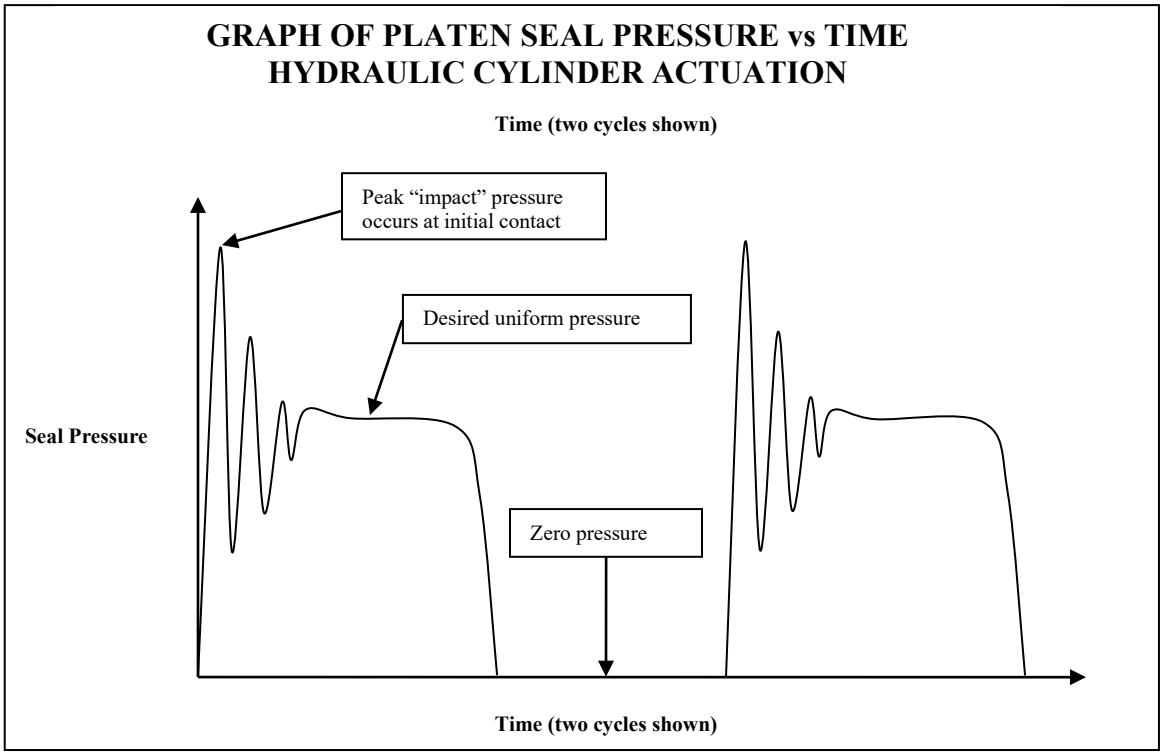
Because variations in temperature can have a most profound effect on seal quality, dedicated control modules within the latest controllers have allowed OEMs to provide systems which can maintain temperature consistency at plus/minus 2° Fahrenheit at a Cpk level which far exceeds the industry standard of 1.33. The results can be seen in this Cpk chart.



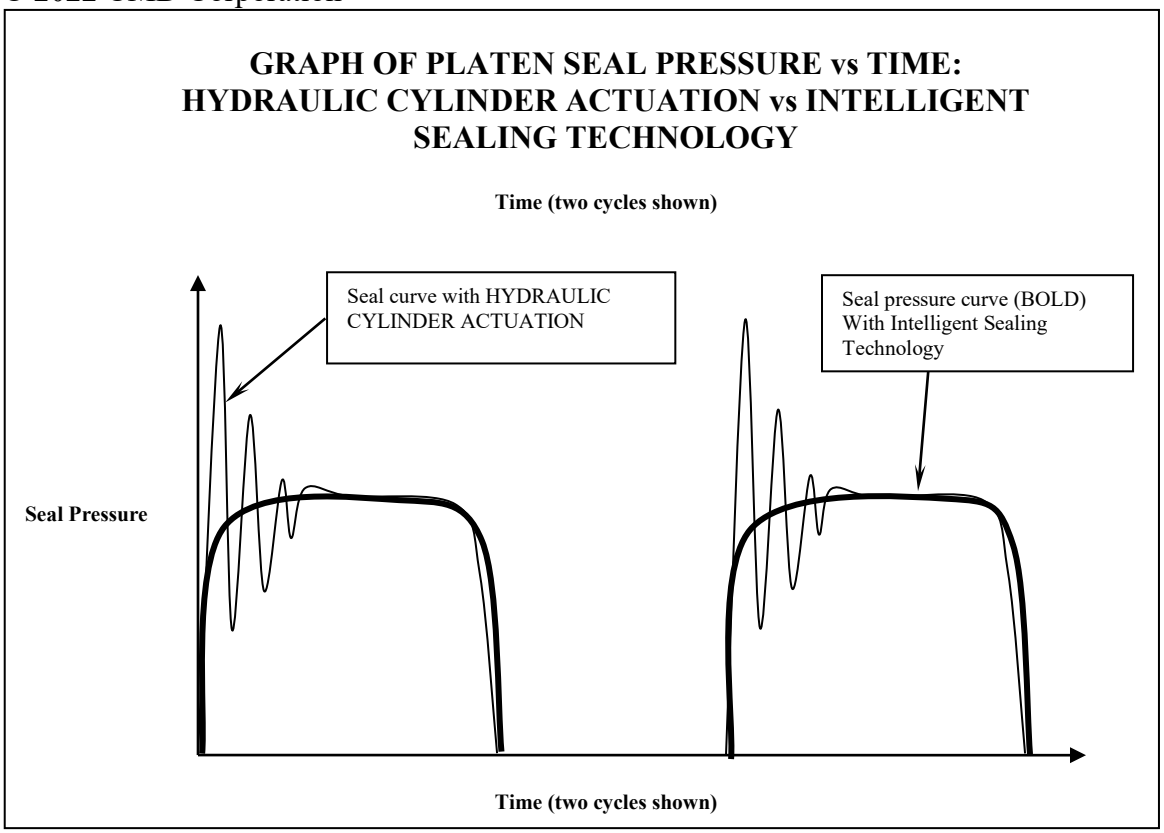
***This test was performed with machine running without film. Results may vary with different structures or thicknesses, and/or varying ambient conditions.*

Pressure:

Often ignored until all other options have been exhausted, seal-pressure inconsistencies can cause intermittent seal-quality failures which become very difficult to track. Further, once the variable of pressure has been identified as the root-cause of a particular failure, tracing the variation back to its origin has been historically very difficult, if not impossible, to do. ***Process Driven Innovation*** approached this opportunity in much the same manner as the whole issue of Time. The measured pressure curve of traditionally available systems very closely mirrored the Time curve discussed earlier.

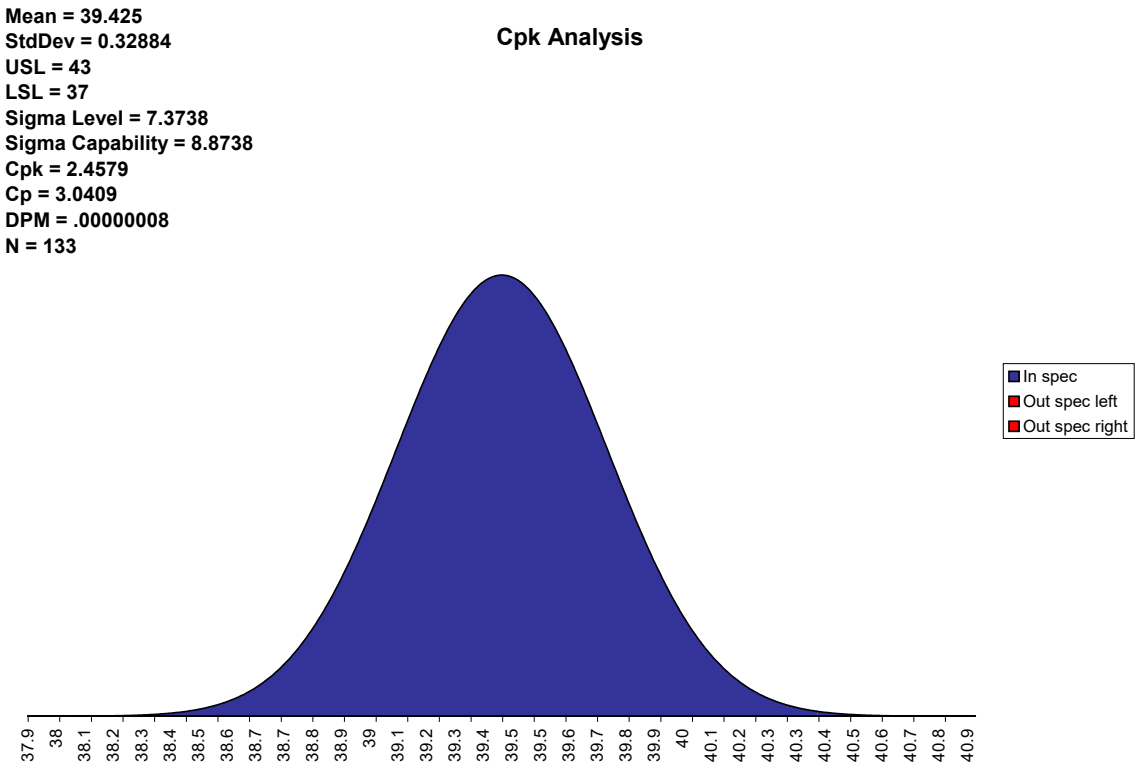


Pressure – continued:

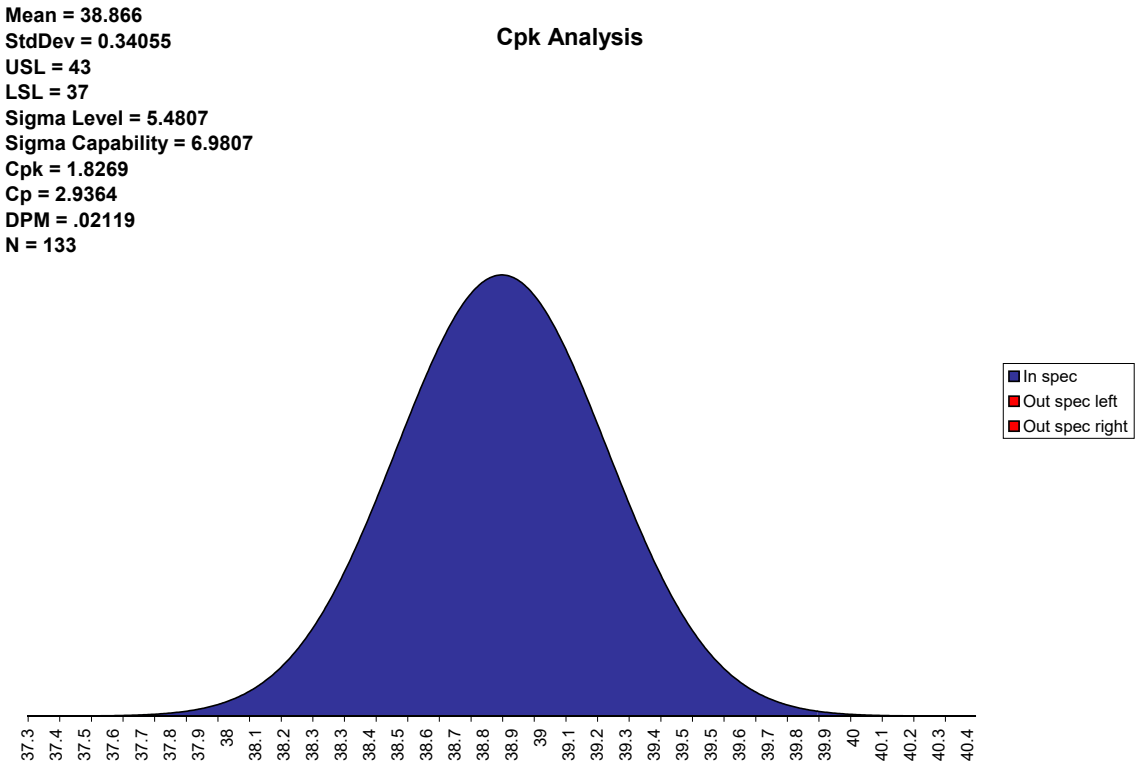


By employing the mechanical principles of Intelligent Sealing Technology, we were able to provide a smooth application of pressure to a rigid sealing surface, as illustrated by the bold traces in the illustration above. From there, we are able to utilize the PID feedback loop within the servo system to produce a pressure reading, which represents total psi applied across the actual sealing surface. We then utilized the tools of Statistical Process Control to analyze the data produced by the system for consistency and repeatability. The results are noted on the next chart.

Pressure – continued:



From there, we compared this data to data derived from the use of actual load-cells placed on the sealing surface. This comparison further demonstrates the system's ability to deliver trustworthy results:



SUMMARY:

Intelligent Sealing Technology delivers consistency and control that can be verified and pouch quality that brand-owners, manufacturers and consumers can trust.

Listening sessions with converters were instrumental in developing Intelligent Sealing Technology. Converters said they wanted to reduce waste and lower costs, while delivering the highest quality pouches. CMD's *process-driven design* and technology allows for confidence in the pouch-making process, while realizing tangible paybacks in process efficiency:

- Reduced set-up time
  - Because all sealing parameters are touch-screen adjustable, there's no need to change springs or adjust regulators. Parameter changes are made simply by entering them on the screen.
- Reduced set-up Scrap.
  - The result of on-board recipe storage of all sealing parameters is that guesswork is eliminated. By entering the recipe code for a previously run job, the temperature, pressure and time components will revert to the optimum run conditions previously identified for that particular product.
- Reduced rework/rejection costs.
  - A process in control naturally yields fewer opportunities for defects, resulting in fewer internal and customer rejections, thus lowering expensive rework costs.

Call CMD today for a free consultation to determine if Intelligent Sealing Technology is right for your operation.

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