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## INTEGRATING SYNERGY 2000™ SPC TECHNOLOGY INTO A SIX SIGMA PROGRAM

Few quality management techniques have had the staying power of Six Sigma, a business philosophy pioneered by Motorola in the mid-1980's. Six Sigma is not so much a radically new way of thinking as it is a successful blending together of desirable "themes" such as customer satisfaction, cost reduction, quality and continuous improvement. Reports of multi-million dollar savings within industry trendsetters like GE, Kodak, Sony, 3M, American Express and Johnson & Johnson, who jumped on the Six Sigma bandwagon over the past 10 years, have truly made the business world sit up and take notice.

In simplest terms, Six Sigma is a strategy that puts customers first by applying vast amounts of data and facts into better solutions for running the business. The ultimate goal of Six Sigma is to achieve as close to zero defects as possible. Its name comes from the statistical concept of *Sigma* or *Standard Deviation*, which refers to the amount of variation in a process. Motorola's assumption was that average processes operate at a Three Sigma level; in contrast, best-in-class processes perform at a Six Sigma level. Therefore, just moving from Three Sigma to Four Sigma, for instance, can increase product yield from 93 to 99% and reduce the number of defective products from 67,000 to slightly more than 6,000—an amazing degree of improvement. Table 1 shows how Six Sigma impacts the delivery of defect-free products and ultimately customer satisfaction.

<b>% Yield</b>	<b>Defects per Million Opportunities (DPMO)</b>	<b>Sigma</b>
30.85	691,500	1
69.15	308,500	2
93.32	66,800	3
99.38	6,200	4
99.977	230	5
99.99966	3.4	6

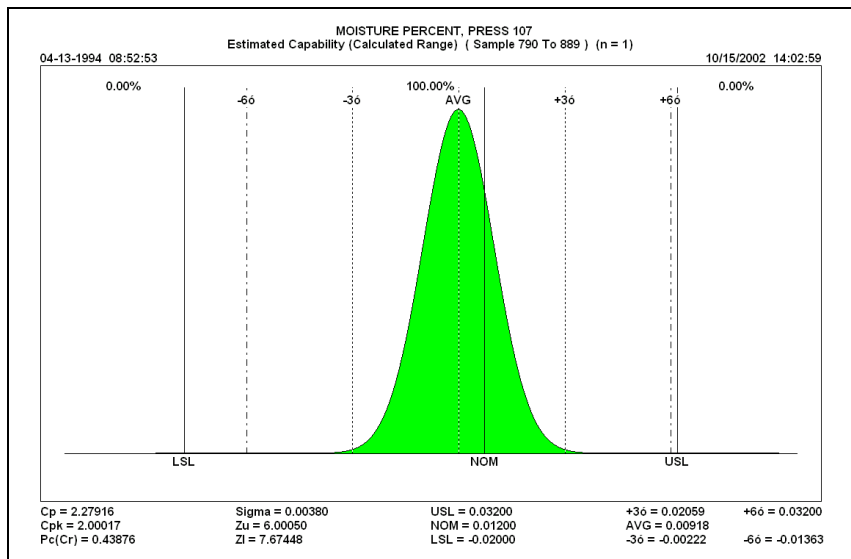
**Table 1**

Another unique element of Six Sigma is the DMAIC approach, which stands for *Define–Measure–Analyze–Improve–Control*. Business systems and IT Departments typically don't possess the types of data needed for DMAIC analysis, so Six Sigma team members go directly to the process to obtain the information on which to draw their conclusions. There are many DMAIC problem-solving tools available

including SPC, but teams are encouraged to make their data collection as simple and easy as possible. They must also focus on recording data accurately and collecting the data consistently. That's where Synergy 2000 Statistical Process Control (SPC) Software enters the picture. Experts believe that companies lose 15 to 20% of revenues to inefficient processes. Synergy 2000 enables businesses to fine-tune their processes using real-time data collection, charting, analysis, monitoring and reporting—a complete package that supports Six Sigma to the fullest.

Given the data-driven nature of Six Sigma, Synergy 2000 provides users with a standardized way of managing process information across the entire enterprise. Synergy 2000 can be used for either variable or attribute data and both types of data can be combined within the same process. The Data Bank/DataTable relationship provides organization and a high degree of structure to the issue of data management. With Synergy 2000, it's not necessary for a user to be concerned with which data files belong to which parts or processes. Once the part is defined (along with its individual measurement or inspection characteristics), the software constantly maps the observation to the correct Data Table. From there, users can slice and dice data any way they wish from process “snapshots” to global summaries to customized reports. The powerful query tool in Synergy 2000 lets users examine data by machine, operator, shift batch, lot, time range, date range, corrective action—or on virtually any criteria they wish. Results are produced instantly for audit trails or traceability questions.

More often than not, tables tend to obscure trends and process behavior. SPC charts, on the other hand, present the data in a much more meaningful way, making corrective actions, conclusions and business decisions intuitively obvious (See Fig. 1). Table 2 provides a breakout of Synergy 2000 chart options and the key features of each.



**Fig. 1**  
**The Synergy 2000 capability study provides a look at how centered the process is compared with engineering tolerances. Notice the relationship between  $\pm 3\sigma$  and  $\pm 6\sigma$  limits and specification limits.**

SPC Analytical Tools	
<b>Variable control charts</b>	$\bar{X}$ & R (or $\bar{X}$ & S, $\bar{X}$ & Moving S or Median & R) featuring display of re-calculation points for new control limits, time & date stamps, sample size, range of samples charted
<b>Attribute control charts</b>	c, p, np, u and DPMO chart options with control limits, time & date stamps, sample size, etc.
<b>Run charts</b>	show individual process observations in sequence with user-defined specification trend settings
<b>Histograms</b>	show variable data over a range complete with curve fittings, average, standard deviation, skew, kurtosis, Chi-square, defective PPM, % out of spec high, % out of spec low, and many other useful values
<b>Capability studies</b>	display process output as it relates to specification and $\pm 3\sigma$ and $\pm 6\sigma$ limits using estimated or calculated Sigma, Pp, Ppk, Cp, Cpk, Pc (Cr), Cpm, Zu, Zl values, loss function and others
<b>Single and multi-category Pareto charts</b>	prioritize problems on attribute data by cost and/or frequency
<b>3 Charts</b>	combine X-bar and R charts with a Moving Range chart for observing batch-to-batch variation
<b>Overlay charts</b>	plots up to three process characteristics onto a single control chart
<b>Moving average-moving range charts</b>	a specialized control chart for processes where it isn't practical to have sample size greater than one, such as continuous chemical processes
<b>Toolwear charts</b>	another specialized control chart showing linear regression for toolwear
<b>Box and whisker plots</b>	examine whether or not a data set is skewed, where the specification limits fall and variability of the data
<b>Gage R&amp;R</b>	provides functions for 2-3 operators to conduct up to a 3-trial repeatability analysis along with Repeatability range chart, Part operator average chart, and Part by operator plot

Table 2

These charting tools arm Six Sigma Black Belts with a comprehensive set of resources for pinpointing root causes of problems in a real-time environment. However, if clear-cut decisions aren't possible, it may be useful to transfer the data into a desktop statistical package such as Statgraphics® Plus for off-line analysis such as ANOVA, DOE, hypothesis testing, correlation, reliability, etc. Synergy 2000 recognizes the importance of these complementary analytical tools that fall outside the realm of traditional SPC, and has incorporated a simple utility into its program to facilitate the exchange of data between the two and similar software programs.

As mentioned earlier, Six Sigma has delivered dramatic results that can be traced directly to the bottom line. But achieving impressive numbers demands a tremendous amount of teamwork. Six Sigma permeates organizational lines and recognizes no departmental barriers. It requires total collaboration among employees as they work together to satisfy customers. It is no coincidence that Zontec believes *all* workers share a stake in their organization's quality. It can't be delegated to the

Quality Department alone. For this reason, Synergy 2000 is designed around a three-level architecture that encourages cross-functional teamwork among process participants: Operators, Quality Engineers, and Management, all focusing on process improvement (Fig. 2). Built-in warnings, alarms and messaging keep everyone informed across the network. The distinctive three-level architecture carries the team concept even further, allowing multiple facilities to be monitored for an enterprise-wide view of every process taking place anywhere in the world. It's a practical, efficient and proactive way to identify problems and improve the process on the spot. With everyone referencing a uniform set of data and working toward the same goals, quality becomes a natural way of running the business.

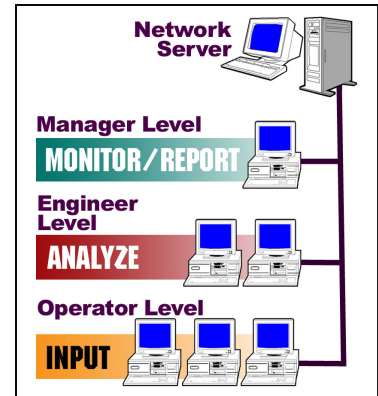


Fig. 2  
Synergy 2000 Encourages a Team Approach to Quality

Synergy 2000 is currently installed in almost 5,000 facilities worldwide. One Zontec customer, a textile manufacturer with operations throughout the U.S. and Mexico, is using the software to prioritize problems within their Six Sigma initiative, and is amazed at the amount of variation they continue to squeeze out of their processes. A major automotive supplier installed Synergy 2000, and within a three-month period, had reduced scrap by 80%. A U.S. defense contractor had been accustomed to two-day turnaround for process feedback, but thanks to Synergy 2000, it's now quantifying parts in real time at 48 production-floor workstations. A plastic injection molding company used Synergy 2000 to consolidate their production and inspection operations, and are saving at least \$100,000 a year in inspection costs alone. Successes like these are the rule, not the exception with Synergy 2000 (Fig. 3).

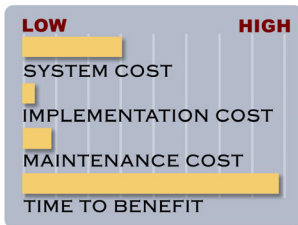


Fig. 3  
Synergy 2000 provides rapid results

With 20 years' experience helping its customers deliver the highest levels of customer satisfaction, Zontec's Synergy 2000 is the logical software companion to Six Sigma when companies won't compromise on anything less than an enterprise-wide view of their process performance.

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