CUTTING DOWN THE JARGON

SPC is simple concept, complicated by a huge amount of jargon which often hinders rather than helps the practitioner. SPC is a technique that should be used on the shopfloor, by operators whose job is to look after processes, not to become mathematicians or statisticians. This section is designed to explain some of this jargon in simple terms. These "definitions" are not meant to be classic definitions. The ISO standard 3534 and other documents will give you these.

Notes:
* If there are any terms which should have been included, but haven't, please let me know.
* If this has just confused you even more, please let me know.

THE JARGON	WHAT IT MEANS
Attribute	A problem with a product or process. They can be of two types, - A defect: a fault within a product (e.g. scratch or dent). - A defective: an unacceptable product (e.g. missing item). In both cases they are counted rather than measured.
Attributes or Variables spc	Attributes are often thought of as "not spc". Because the application of spc originated in engineering industries, it is often thought of only in terms of measuring things (variables), and therefore as a glorified inspection system. Attributes spc is much more likely to occur outside manufacturing, and in an assembly or administrative environment, but is often capable of providing benefits to an organisation long before variables spc will.
C Chart	A control chart used in attributes, showing number of defects.
Capability Indices	The ratio between the amount of variation specified by the customer (the specification limits) and the variation that the process actually exhibits (6 sigma). Two ratios are normally used. The first (e.g. Cm/Pp/Cp) gives the overall view and the second (e.g. Cmk/Ppk/Cpk) looks at each side of the average, and gives the worst case. This shows how centred a process is. If for example Cp = Cpk then the process is centred.
Capability Study	A test at the outset of a process to see whether particular conditions of manufacture are likely to result in acceptable products. Acceptability is based on the 3 critical factors: - How does the average compare to nominal - How much spread is there - Does the data look as you would expect , e.g. is it symmetrical?
Capable Process	A process that is running within specification limits.
Cause and Action Analysis	When a process is not in control, each point out of control should if possible be tagged with either a cause or an action. These should then be analysed over a period using a pareto chart to identify their importance or relevance. The biggest are targeted first as they will produce the quickest route to process improvement. See also subgroup tagging.
Central Limit	Sorry to be technical, but this is the fundamental reason why control charts (and therefore spc) works. The central limit theorem says that once you start sampling, the distribution of the averages of each subgroup tends to be a normal distribution. This starts to happen at a subgroup size of 3, but at 5 and higher, it is a good fit. This is why everyone seems to use a subgroup size of 5.

Theorem	Therefore, if you sample data from a process regularly, then the way that the averages and ranges are distributed should represent a normal distribution if everything is still random. If they don't, then the process is not operating randomly and is out of control.
Cm / Cmk	The capability indices used in an initial feasibility (capability) study. They should be higher than 1.33, although some companies suggest that 1.66 is the lowest acceptable level.
Control Chart	A time chart where information from regularly taken subgroups is plotted to see whether a process is running as it should. There are several different control charts which apply in different situations. Most contain two separate but linked charts which show the position (e.g. Xbar) on one and the spread (e.g. range) on the other.
Control Limits	Levels on a control chart calculated from the data within which all plotted points should lie if the process is behaving itself. To be useful, Control Limits should be dynamic (i.e. change to reflect what is happening in the process) Too often they are fixed at outset and never changed even though the process itself changes regularly
Cp / Cpk	The classic capability indices used in an ongoing study. They should both be greater than 1.00 and ideally close to each other in value.
Cusum	Control chart normally used in high volume continuous processes, where the cumulative sum of the differences between successive points is plotted. This gives an idea of both position and spread on the same chart, and tends to show up process changes quicker than the conventional Xbar / R charts. In high volume manufacturing this is important.
Defectives	Unacceptable product. Used in Attributes spc.
Defects	Attributes which are unacceptable, but which do not necessarily amount to a rejection of the product.
Gauge R & R	Gauge repeatability and reproducibility. A technique to determine that the measuring system is fit for the task and does not vary too much.
Histogram	A chart used to present an amount of data or number of data points within specific groupings. Used as a first indication of the shape of a data distribution.
Incapable Process	A process which is exceeding specification limits.
Individuals charts	Control charts produced when you can only take data in samples of 1.
Kurtosis	How peaked or flat a distribution is. A true normal distribution has a kurtosis factor of 3. A higher value means it is more peaked and a lower value means it is flatter than it should be.
LCL	Lower control limit (approximately 3sigma below the mean). Is applied to all charts.
M S A	Measurement System Analysis, as QS9000 now refers to Gauge R & R. A technique to determine that the measuring system is fit for the task and does not vary too much. MSA includes more analysis than Gauge R & R.
Moving X / R chart	Control chart produced from single samples but where both the mean and the range are averaged over a number of readings to allow the Central Limit Theorem to take effect.
nP Chart	Control chart used in attributes, plotting number of defective parts.
P Chart	Control chart used in attributes, plotting percentage of defective parts.
Pareto chart	A standard business tool for presenting data in descending order of importance. Used in attributes spc as well as in analysing cause and action information.

Pp / Ppk	The capability indices used in a potential process study. These are only required for specific companies and should be greater than 1.33. Calculated in exactly the same way as Cp and Cpk.
Process in Control	A process where all variation is random. Must obey the three basic rules: - No points outside control limits - No runs of 7 points ascending or descending - No trends of 7 points above or below the average (mean) Other rules should ideally be obeyed - see sigma zoning, but these vary between International Standards.
Range	The highest reading minus the lowest reading within a set of data.
Range bar	The average of the ranges (i.e. add all the ranges and divide by the number of ranges)
S.P.C.	Statistical Process Control. A technique to discover whether your processes are running as expected - while they are running
S.Q.C	Statistical Quality Control. A technique to discover whether your processes ran as expected - after the event.
Sample	A single measurement of a variable.
Sample Mean	The average or Xbar of a subgroup of data (normally small) which is plotted on the Xbar part of a control chart
Shape	A measure of variation, analysed by examining the distribution of data from a process
Shifts	A run of 7 points that lies above or below the mean of a control chart. This is evidence that a process has moved over a specified period and needs to be brought back to nominal.
Short run	An spc technique devised by Davis Bothe (USA) for low volume production (originally military and aerospace). In these cases, not enough data can be gathered for conventional spc. Mathematical adjustments are made so that similar processes can be plotted together. When this is done, the technique effectively forces the implementation towards an understanding the process rather than an inspection of the product. Many companies monitor each product (or part number) on a separate chart. Sometimes this is necessary, but where two or more processes are similar, or identical, why treat them as though they are different? Because of this, Short Run can also be very effective In situations where production is high, but run over short periods. For more information see section on Short Run
Sigma zoning	Because of the central limit theorem, the points on a sampled control chart should represent a Normal distribution. This means that approximately 2/3 of the points should be between +/- 1sigma, 95% between +/- 2 sigma etc. If they are not (significantly) then the distribution isn't normal, the chart is not random and the process is not in control. Sigma zoning is normally presented in International Standards as descriptive rules, e.g. the middle third rule. This is also known as the traffic light system – Green within +/- 1 sigma, Amber between 1 and 2 sigma and red outside these. This can be visually very useful.
Sigma	An estimate of standard deviation. Usually calculated from range or sigma chart. Often denoted as s.
Sigma bar	The average of the sigmas (add and divide by the number of sigmas).
SIX SIGMA	An invention of Motorola in the 80's to try to turn SPC into a philosophy and apparently to make it "FUN". SPC is one of many practical tools that helps to solve problems, nothing more, nothing less; to turn into anything else is to miss

	the point.
Skewness	How symmetrical a distribution is. A symmetrical distribution has a skewness factor of 0.
Special Causes	These are what spc looks for. They are evidence that a process is not in control. They are identified when any of the rules for stability are broken. It is important that they are logged, and wherever possible tagged with some information as to why they happened or what you did to correct the process.
Specification Limits	The maximum spread within which a process should run. Same as tolerance limits. Usually set by the customer, but frequently set based on familiarity rather than on any ability to achieve them.
Spread	Consistency. How close together the data is. Normally calculated from either the range or standard deviation, dependent on the amount of data.
Stable Process	A process where all of the variation is due to natural causes. Synonymous with "Process in Control".
Standard Deviation	How the data is varied around the mean. A better measure of spread than range particularly when there are a lot of readings. Usually estimated as sigma or s or s.
International Standards	Although spc is fairly well defined, many different standards can apply. They all aim towards the same ideal, but only help to confuse the user by their slightly different application of statistical rules. A single standard would make life much easier, and this ideally ought to be an independent standard like the ISO standard (yes there is one!). QS9000 (automotive) seems to have donned the mantle, although what an engineering standard, and predominantly engineering terminology, has to do with food manufacture is anyone's guess.
Subgroup	A small group of samples. Normally used for producing control charts, either for a variable or an attribute.
Subgroup Size	The number of samples within a subgroup.
Subgroup Tagging	When you are collecting data for a control chart it is often useful to collect other information which may relate to why a process might change. By analysing these over a period, you will gain greater knowledge of the way that processes work.
Target	The desired or nominal value of a variable.
Tolerance Limits	The maximum spread within which a process should run. Same as specification limits.
Trends	A series of 7 or more points that gradually increase or decrease on a control chart. This means that a movement in the process is occurring. This can happen quite logically (e.g. tool wear) and therefore a natural part of the process. Such trends, however, do need to be controlled, and understanding them better could lead to a better use of resources.
U Chart	Control chart used in attributes, showing percentage of defects.
UCL	Upper control limit (approximately, 3s above the mean). Applied to both mean and range (sigma) charts
Unstable Process	A process where some of the variation is caused by unusual events.
Variable	A dimension capable of measurement e.g. length, weight, height, diameter etc.
Variation	The reason why quality control exists. No two items are exactly the same even under the most stringent conditions. Variation needs to be studied to understand how much and why a process varies, so that you can limit its effects

	to an acceptable minimum and give your customer what has been specified.
Weighted Pareto chart	A pareto chart where the defects are given a weighting factor making them more of less important. The weighting factor can be a number (say 1 - 10) but is more useful if it represents time or money. A weighted pareto chart has the effect of focusing attention on the more important faults.
X	An individual reading.
X / Moving R chart	Plots the individual reading on one chart and plots a range averaged over a number of readings on the other chart.
X bar	The arithmetic average of a set of readings. (i.e. add the readings and divide by the number of readings)
X bar / Range chart	Plots the mean (X bar) on one chart and the range on the other. The subgroup size must be greater than 1 and is normally 5.
X bar / Sigma chart	Plots the mean on one chart and sigma on the other. Normally used when the subgroup size is larger than (say) 6, although some companies use all the time
X bar bar	The average of the averages. Sometimes called the grand mean or process mean: (i.e. add all the X bars and divide by the number of the X bars)