cp-spc manual

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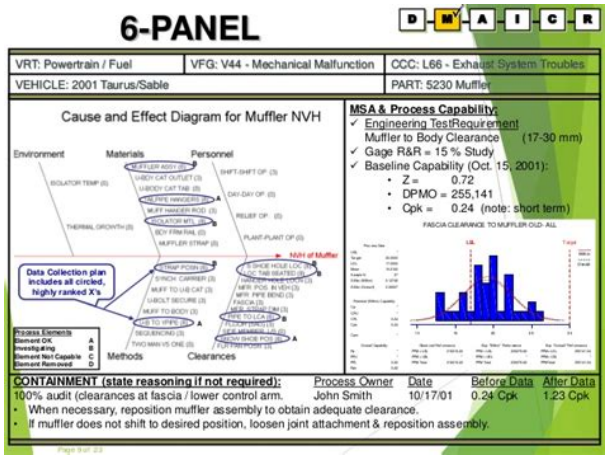
Book Descriptions:

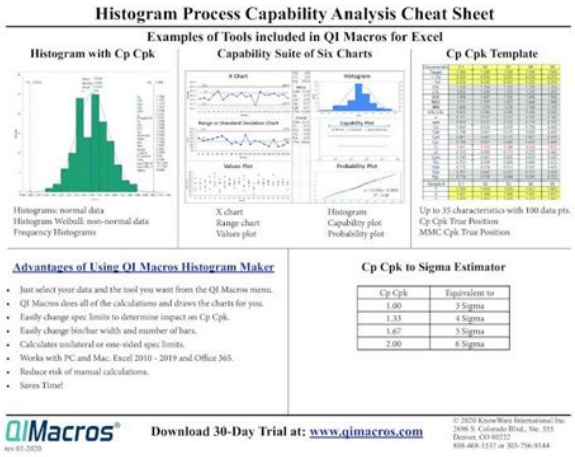
cp-spc manual

The objective is to stabilize the process. A stable, predictable process is said to be in statistical control. During this phase, data analysis and reaction to special causes is done in real time. Once stable, the process can be analyzed to determine if it is capable of producing what the customer desires. Gain a basic understanding of how to establish, analyze and implement a statistical process control SPC system in a manufacturing environment. Keep AIAG's APQP manual on hand as a reference guideline. The manual covers the majority of situations that occur in early planning, design, or process analysis phases. This event scheduled for September 17, 2020 at 1000am EST is complimen. AIAG membership includes leading global manufacturers, parts suppliers, and service providers. Covers advanced quantitative tools. Includes exercises, quizzes, and mini simulations. After early successful adoption by Japanese firms,Dr. DemingThis can be expressed by the range highest lessThe standardConsider two examplesIf you are then told that theThese can be used as probability tables to calculate the odds that a givenThis construction forms the basis of the Control chart.The flowchart below outlines the major components of an effective SPCIf that error exceeds an acceptable level, the dataFor example a Midwest building products manufacturer found that manySee the Measurement Systems Analysis section of the Toolbox forA bar, or line, above a letter denotes the average value for thatThe second subgroup has the following. The average of the two subgroup averages isRead Section 10 below toMany reaction plans will be similar, or even identicalFollowing is an example of a reaction plan flow chartThe only exception is the moving range chart, which is based on a subgroup size of one. Suppose the upper specification limit is 16.A template can be accessed through the Control Plan section of the Toolbox.http://www.marjoleintje.nl/include/userfiles/flatron-m1910a-manual.xml

- **cp-spc manual, cpsp manual, cpsc manual.**



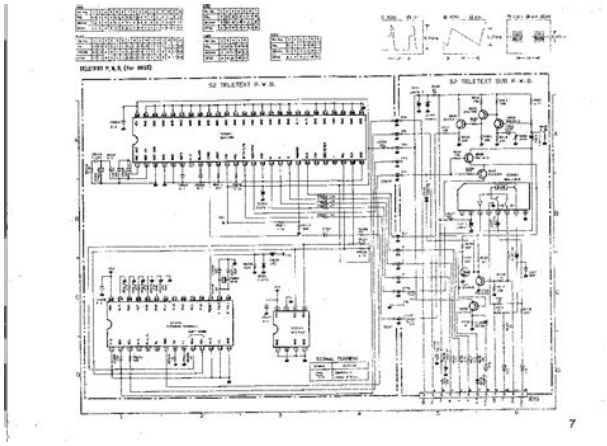
This determination is made by observing the plot pointProcess shifts, outofcontrol conditions, and corrective actions should be noted on the chart to help connect cause and effect in the minds of all who use the chart. The best charts are often the most cluttered with notes!You can use MoreSteam.comsYou can use the Corrective Action Matrix to help organize and track theThe difference between the upper and lowerDistributions with other shapes areA process can have a Cp in excess ofCpk is calculated as followsThe process will be most effective if senior managers make it part of their daily routine to review charts and make comments. Some practitioners initial charts when they review them to provide visual support. Charts that are posted on the floor make the best working tools they are visible to operators, and are accessible to problemsolving teams.This tool requires a great deal of coordination and if doneFlexible training at an affordable price. In Six Sigma we want to describe processes quality in terms of sigma because this gives us an easy way to talk about how capable different processes are using a common mathematical framework. In other words, it allows us to compare apple processes to orange processes. Process Capability This is a long article, but I thought it was important to keep Cp and Cpk together. Cpk is addressed first, then Cp. There are also crib notes on what the equations mean in a real performance sense, what you should be able to tell about a process depending on Cp and Cpk values and more. If you are not finding what you are looking for, please let me know in the notes below. Before We Begin! This article was written to help Six Sigma Green Belt and Black Belt candidates prepare for and pass their exams. If that's you, leave me a comment below or contact me and let me know which organization and belt you're studying for. This will help me make the article even better for you.http://www.neline.nl/userfiles/flatron-w1934s-bn-service-manual.xml



If you're studying for something else, please leave a comment or contact me and let me know what you are studying for. Again, this will help me make the article better for you and everyone else.

Thanks, Ted. What is the Difference between Cp, Cpk and Pp, PPk. Cp Cpk vs Pp Ppk Cp and Cpk are called Process Capability. Pp and Ppk are called Process Performance. In both cases we want to try to verify if the process can meet to meet Customer CTQs requirements. Cp, and Cpk are used for Process Capability. Generally you use this when a process is under statistical control. This often happens with a mature process that has been around for a while. Process capability uses the process sigma value determined from either the Moving Range, Range or Sigma control charts Pp and PPk are used for Process Performance. Generally you use this when a process is too new to determine if it is under statistical control. Ex. there is a short preproduction run or you are piloting a new process. Because there is not a lot of historical data we take large samples from the process to account for variation. Process Performance generally uses sample sigma in its calculation. In theory Cpk will always be greater than or equal to Ppk. There are anomalies seen when the sample size is small and the data represents a short amount of time where estimating using R will overstate standard deviation and make Cpk smaller than Ppk. It is not real, there can never be less variation in the long term since the long term is using all of the data not just two pieces of data from every subgroup. Cpk vs Ppk P pk tells us how a process has performed in the past and you cannot use it predict the future because the process is not in a state of control. If a process is in statistical control; The values for C pk and P pk will converge to almost the same value because sigma and the sample standard deviation will be identical use an F test to determine .

If a process is NOT in statistical control; Cpk and Ppk values will be distinctly different, perhaps by a very wide margin. What is the Difference Between Cp and Cpk. Cp vs Cpk Cp and Cpk measure how consistent you are to around your average performance. C pk tells us what a process is capable of doing in future, assuming it remains in a state of statistical control. The Shooting at a Target Analogy In a perfectly centered data set, there will be no difference between Cp and Cpk. Think of throwing darts at a dart board and having the center of the bull’s eye be the 0,0 on a cartesian plane and the edges being out 3 units from that center point we will use the edge of the dart board or 3 and 3 as our USL and LSL. In a perfectly centered sample of darts, your average distance from the center, or Mu, will be 0. A little algebra will show us that that your Cpk and Cp numbers come out the same. Things get a little harrier when the darts move up, say to be centered at an average of 2 units above center. It is important to note that because Cpk uses the minimum function, it will always be equal to or smaller than the Cp for the same set of data. If you go past those limits, you will crash, and the customer will not be happy. If your process has a lot of variation, that means the process average is all over the place. Not good for parking a car, and not good for any other process. To give your parking process the best chance of success you should work on reducing variation and centering. If the car is too wide for the garage, nothing you do to center the process will help. You have to change the dispersion of the process make the car smaller. If the car is a lot smaller than the garage, it doesn’t matter if you park it exactly in the middle; it will fit and you have plenty of room on either side. That’s one of the reasons the six sigma philosophy focuses on removing variation in a process.



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If you have a process that is in control and with little variation, you should be able to park the car easily within the garage and thus meet customer requirements. C pk tells you the relationship between the size of the car, the size of the garage and how far away from the middle of the garage you parked the car.” How to Calculate Cpk Cpk is a measure to show how many standard deviations the specification limits are from the center of the process. On some processes you can do this visually. Others require an equation. To find Cpk you need to calculate a Z score for the upper specification limit called Z USL and a Z score for the lower specification limit called Z LSL. Since we are trying to measure how many standard deviations fit between the center line and the specification limit you should not be surprised that the value of those limits, the process mean, and the standard deviation are all components of the Z calculation. Cp is an abbreviation. There are really two parts; the upper and the lower denoted Cpu and Cpl respectively. We know that any specification limit has an upper bound and a lower bound. Calculating Cpk using a Z Value If you have a Z value, the equation is very easy; Cpk can be determined by dividing the Z score by three. A z score is the same as a standard score; the number of standard deviations above the mean. Notes and Characteristics of Cpk Cpk and Centered Processes If a process is perfectly centered, it has a Cp of 1. That would indicate that mean was 3 standard deviations away from the upper limit and the lower limit. Let’s check the math. The exact same thing. Notes on Cpk C pk measures how close a process is performing compared to its specification limits and accounting for the natural variability of the process. Larger is better. The larger Cpk is, the less likely it is that any item will be outside the specification limits.

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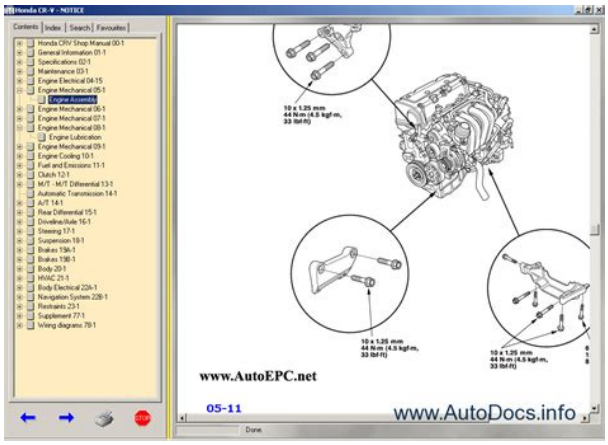

When Cpk is negative it means that a process will produce output that is outside the customer

specification limits. Cpk can have an upper and lower value reported. If the upper value is 2 and the lower is 1, we say it has been shifted to the left. This tells us nothing about if the process is stable or not. We must report the lower of the 2 values. That was poorly centered. What are Good Values for Cpk. Remember the Car parking in the garage analogy. You could double the width of your car before you hit the side of the garage. You could triple the width of your car before you hit the side of the garage. In Cp, we replace s with and estimate of we call r. To do that we leverage the Moving Range concept from a Moving R Bar chart or an XMR Chart. D2 reflects values derived from integrating the area under the normal curve. We often use a table which gives a d2 value based on how many subgroups were in the sample.Capability Index How do Cp, Z values, DPMO, Specification Limits, Standard Deviation, and Capability all relate. Also see Z values and process capability. Capability Index Notes on Cp Values If the ratio is greater than one, then the Engineering Tolerance is greater than the Process Spread so the process has the “potential” to be capable depending on process centering. If, however, the Process Spread is greater than the Engineering tolerance, then the process variation will not “fit” within the tolerance and the process will not be capable even if the process is centered appropriately. Because Cpk accounts for centering where Cp does not, Cpk can never be larger than Cp. Both assume a stable process. Process Capability Videos Cpk Videos Great, clear, concise video on this subject. “If you were producing a Cpk equal to 1, than you could expect to produce at least 99.73% good parts.

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” Lecture on Process Capability and SPC ASQ Six Sigma Black Belt Certification Process Capability Questions Question Data being used in the initial setup of a process are assumed to have a normal distribution. Sign up in seconds with the buttons below. Login to your account OR Enroll in Pass Your Six Sigma Exam OR Get a Free Account Questions, comments, issues, concerns. Sign up in seconds with the buttons below. Login to your account OR Enroll in Pass Your Six Sigma Exam OR Get a Free Account Questions, comments, issues, concerns. Please leave a note in the comments below! A The tolerance interval B The confidence interval for the result C The range of the process D The variance of the index This section requires you to be logged in. Cp, Cpk, Pp, Ppk Practice Questions and Z Charts Practice makes perfect. F ree Cp, Cpk, Pp, Ppk practice questions. Success! Now check your email to confirm your subscription. There was an error submitting your subscription. Please try again. First Name Email Address We use this field to detect spam bots. If you fill this in, you will be marked as a spammer. Id like to receive the free email course. Download Now! We wont send you spam. Unsubscribe at any time. Powered by ConvertKit This entry was posted in Measure and tagged ASQ, BB Exam, Black Belt, GB Exam, Green Belt, IASSC, Villanova, Yellow Belt. Bookmark the permalink. Comments 121 Joanna Han says November 19, 2014 at 305 pm Hi, if I have a set of data where the subgroup size is different, how should I determine which d2

value to be used for the Cpk calculation. Reply Joanna Han says November 20, 2014 at 127 pm Yes. My first question was about how to determine d2 for multiple subgroups of varying size, i.e. what you have given in the example. Reply Six Sigma Study Guide says November 20, 2014 at 725 pm Joanna, you've asked a great question and I'm going to need to study a bit more before I can answer.

If you were designing the sampling, I'd suggest controlling it so that your subgroups were the same size. Since we all know that in practice we often inherit data, so this may not be possible. My instinct would be to take the average of the subgroup sizes. A friend suggested I check the text Statistical Quality Control by Grant and Leavenworth. Trying to get my hands on a copy now. Reply Joanna Han says November 21, 2014 at 104 pm Hi, I am doing data analysis where the subgroup size is not constant. I was thinking to take the majority or average but I have found that there is formula to determine the sigma. C4 is a different form of unbiasing constant that doesn't require the sub groups to be the same size. Reply Praful bhusari says February 15, 2016 at 1030 pm WHAT IS DIFFERENCE between CP and CPK. Reply Six Sigma Study Guide says February 15, 2016 at 1033 pm The Shooting at a Target Analogy A good analogy is shooting at a target. If the rounds form a good cluster or grouping in the same spot anywhere on the target you have a high Cp value. When the you have a tight group of shots is landing on the bulls eye, you now have a high Cpk Cpk measures how close you are to your target and how consistent you are to around your average performance. A person may be performing with minimum variation, but he can be away from his target towards one of the specification limit, which indicates lower Cpk, whereas Cp will be high. On the other hand, a person may be on average exactly at the target, but the variation in performance is high but still lower than the tolerance band i.e., specification interval. In such case also Cpk will be lower, but Cp will be high. Cpk will be higher only when you r meeting the target consistently with minimum variation Reply Pavel says March 22, 2016 at 849 pm Hello. How was out of spec percentage 2.28% calculated in a video lesson. Reply Six Sigma Study Guide says May 1, 2016 at 403 pm Hi Pavel, it was calculated using a Z Score.

See the notes that Joanna Han left above. How can I help Reply bhushan kumar says May 25, 2016 at 804 am cpk value is 1.12, is it process is good. Reply Six Sigma Study Guide says July 2, 2016 at 1026 am It's ok. It's not great. Reply Ted Hessing says July 27, 2019 at 1053 am Thanks for the question. I've added this as a question in the Pass Your Six Sigma Green Belt question set. Sign up or log in for access. Reply ddot.re says May 25, 2016 at 107 pm best summarized Cp Pp Cpk PPk chart that capsulizes dignificant facotrs Reply Six Sigma Study Guide says July 2, 2016 at 1024 am No idea what you are asking for. Reply vinod thorat says November 8, 2019 at 1057 pm what is guide lines whichfor process capability limit in Pharmaceutical industreies Reply Abhinav singh says June 25, 2016 at 218 pm What is the value of Cpk for six sigma process Reply Six Sigma Study Guide says July 2, 2016 at 1020 am It's an equation, Abhinav. Read the article. Reply Ted Hessing says July 27, 2019 at 1052 am Thanks for the question. I've added this as a question in the Pass Your Six Sigma Green Belt question set. Sign up or log in for access. Reply prabin says November 15, 2016 at 500 am A process that has a Cp 1 and a Cpk 1, is Reply Six Sigma Study Guide says December 17, 2016 at 1214 pm What do you think, Prabin. Reply Ted Hessing says July 27, 2019 at 1053 am Thanks for the question. I've added this as a question in the Pass Your Six Sigma Green Belt question set. Sign up or log in for access. Reply karen says November 15, 2016 at 549 pm Can you solve the problem. The weights of nominal 1kg containers of a concentrated chemical ingredient are shown in Table 8E.2. Suppose there is a lower specification at 0.995 kg. Calculate an appropriate process capability ratio for this material. What percentage of the packages produced by this process is estimated to be below the specification limit.What have you tried so far.

Reply Ted Hessing says July 27, 2019 at 1054 am Thanks for the question. I've added this as a

question in the Pass Your Six Sigma Green Belt question set. Sign up or log in for access. Reply Ted Hessing says July 27, 2019 at 1055 am Thanks for the question. I've added this as a question in the Pass Your Six Sigma Green Belt question set. Sign up or log in for access. Reply Gianfranco says November 30, 2016 at 924 pm Hi, I have a doubt about the table under the "Capability Index" paragraph. Thank you so much. Reply Ted Hessing says July 27, 2019 at 1056 am Hi Amit, I've added videos to help explain. Can you elaborate Reply Guru says February 13, 2017 at 719 am Hi, I have a data which contains the quality scores of the individual persons from last 50 weeks Individual scores for 50 persons on 50 weeks. Or any other method will be used. Please suggest. Thanks in advance. Reply Six Sigma Study Guide says February 15, 2017 at 931 pm Guru, I'm not entirely sure what you are asking. Can you add a bit more detail. Reply Guru says February 15, 2017 at 1115 pm Hi, Sorry for my unclear question before. Currently, I have been measuring the quality for a group of staffs on a weekly basis. I also set a bandwidth that the staffs who scored more than 90 percentage were good and less than 90% was bad. Now I have the data history for the last one year. If I want to see the statistical detail for the past one year datawhich means can I able to say the sigma levels for each staff what method will be used. Reply Six Sigma Study Guide says February 16, 2017 at 529 am Interesting question. Is the sample size homogeneous. Were the same people measured for every test or did the population change over time. Was the test the same each time. Reply Guru says February 16, 2017 at 616 am Thanks for the comments. 1.The sample size was homogeneous. 2.Mostly same people were measured for every test. Sometimes, the new people were added and will be added overtime. 3.

The population will slightly change every time. 4.The testing method will be the same each time. Then use an attribute chart to show changes over time where each fail is a "defective" not a "defect". You'd calculate baseline sigma like so. Look at what Jeremy did in his case study on using control charts on student test scores. Depending on your use, you might consider an EWMA chart. If you want to compare the different populations against each other, consider a MANOVA. Guru says February 18, 2017 at 715 am Hi Thanks very much for the detailed response. Now I will start my analysis with the baseline sigma. Reply Six Sigma Study Guide says February 21, 2017 at 809 am This is a good homework question because it shows the relationship between process capability and quality. Start by listing the Cpk formula and substituting the 2.0 value. What are you left with. Reply Ashley says February 22, 2017 at 1255 pm It is a homework question. He said, define the Cpk and Z score formulas first. Then start applying your substitutions. Reply Ted Hessing says July 27, 2019 at 1102 am I see. Try this walkthrough on z score and process capability. Reply Adam Au says April 7, 2017 at 218 am Dear Sir, I wish to sign up to your newsletter. The best place is to sign up here. You'll get access to a bunch of free questions, lots of help answering them, as well as practice tests, strategies, and other helpful downloads. Reply Alex says October 24, 2017 at 511 pm pls how do you solve this What is the Ppk of a process with a spread of 24 units, an average of 68, an upper limit of 82 and a lower limit of 54 Reply Six Sigma Study Guide says December 10, 2017 at 1052 am Alex, what have you tried here. I've added this as a question in the Pass Your Six Sigma Green Belt question set. Sign up or log in for access.

Reply Alexander Coulter says November 15, 2017 at 1041 am In the section "How to Calculate Cpk" you describe Cpk as the minimum of two scaled zscores, where those scores are Cpl and Cpu the "Cps". Zscores are calculated using standard deviations, which you also say in that section and immediately following ones. Which is it Reply Ted Hessing says July 27, 2019 at 1105 am Thanks for the question. I've added this as a question in the Pass Your Six Sigma Green Belt question set. Sign up or log in for access. I've added this as a question in the Pass Your Six Sigma Green Belt question set. Sign up or log in for access. Reply Jerome says March 20, 2018 at 927 am When cpk and ppk are close in value it represents a stable process, and when they are far apart it shows an unstable process. My question is, how far apart can they be where one can say if the process is stable or unstable. Reply Ted Hessing says July 27, 2019 at 1110 am Thanks for the question. I've added this

as a question in the Pass Your Six Sigma Green Belt question set. Sign up or log in for access. Reply Vikram Nayak says March 29, 2018 at 446 am I m involved in manufacturing of pharma products.Total number batches are 10 and Cpk of assay of batches is 0.97. Is it acceptable If not then what would be the imapct of sample size on Cpk Please reply. Reply Ted Hessing says July 27, 2019 at 1111 am Thanks for the question. I've added this as a question in the Pass Your Six Sigma Green Belt question set. Sign up or log in for access. Reply Wisley Wu says June 24, 2018 at 916 pm Hi Ted I appreciate that you continue share the six sigma information to me. We have some questions about six sigma calculation. I think that I can discuss with you, could you please kindly to answer 1. When we talking about the capability of a process, we usually use cpk to show how well the process is. For example, if a dimension is a key characteristic of a product, we have USL and LSL from the drawing.

We want to know the capability of the process. So we sample 32x and we can calculate the cpk of the dimension from the 32x data. If I know the yield rate of our product like 95% , how can I transfer 95% to a sigma value. And if we can transfer yield to sigma level. Do we need to measure the process driftaccording to Motorola, the long term drift is 1.5 sigma Or we just need to calculate the short term sigma level. Reply wisley says June 24, 2018 at 1155 pm Hi Ted I appreciate that you continue share the six sigma information to me. We have some questions about six sigma calculation. I think that I can discuss with you, could you please kindly to answer 1. When we talking about the capability of a process, we usually use cpk to show how well the process is. For example, if a dimension is a key characteristic of a product, we have USL and LSL from the drawing. We want to know the capability of the process. So we sample 32x and we can calculate the cpk of the dimension from the 32x data. If I know the yield rate of our product like 95% , how can I transfer 95% to a sigma value. And if we can transfer yield to sigma level. Do we need to measure the process driftaccording to Motorola, the long term drift is 1.5 sigma Or we just need to calculate the short term sigma level. Reply Ted Hessing says July 27, 2019 at 1117 am Wisely, That's great question that will take a lot of thought. At first pass I think you can examine the relationship between z scores and process capability here. Perhaps I'm missing something, but I don't think you would account for process drift on something you just sampled. Am I interpreting your question correctly. In such case also Cpk will be lower, but Cp will be high. The final sentence also implies that Cpk can be higher than Cp, which is not true. Reply Ted Hessing says July 27, 2019 at 1125 am This is a good question. I've added this to my list of improvements. Let's check the math." Cp has nothing to do with whether a process is centered.

There is no sample mean in the equation. Cp is the ratio of the spec range over the sample std dev. Reply Ted Hessing says July 27, 2019 at 1125 am Again, this is a good question. I've added this to my list of improvements. Thanks Reply Ted Hessing says September 5, 2018 at 423 pm Hi Dany, I only have the capacity to answer these kind of questions in the paid forum. We'd love to have you join! Best, Ted. Reply samy says October 6, 2018 at 317 am I am a QHSE mgr, in an industrial company for prefabricated substations and switchgears and control panels,it means we're not a mass production company and the only one product may has a many defects.Right now I only have the capacity to answer these kind of questions in the paid forum. I'd love to have you join! Best, Ted. Reply BB says November 27, 2018 at 1235 pm Using this partial Z Table, how many units from a month's production run are expected to not satisfy customer requirements for the following process. Upper specification limit 8.4 Lower specification limit 4.7 Mean of the process 6.2 Standard Deviation 2.2 Monthly production 360 units Reply Ted Hessing says July 27, 2019 at 1126 am Thanks for the question. I've added this as a question in the Pass Your Six Sigma Green Belt question set. Sign up or log in for access. Reply James Berto says November 29, 2018 at 1111 am Application for Copyright Permission For Educational Use November 29, 2018 The Southern Regional Education Board SREB and the state of Ohio are partnering in the development of an Automated Materials Joining Technology AMJT curriculum for high school students. The curriculum is part of SREB's

Advanced Career AC project that involves 9 states in the development of projectbased curriculum with each state authoring its own unique career area.

We are writing to request copyright permission for teachers and students to view the following link for completing Project 2 in Course 3 Advanced Concepts in Materials Joining Also, no changes in or deletion of author attribution, trademark, legend, or copyright notice will be made, if permission is granted. We hope you will be able to respond positively to our request. Is the Cpk equation need to be modified to include this offset target. And what is the new Cpk equation. Reply Greeshma Nair says February 15, 2019 at 159 pm Hello, Can you tell me if we can calculate percentage non defectives using the values of Cp and Cpk. Reply Ted Hessing says February 16, 2019 at 316 pm Greeshma, Yes, I can tell you, but let's reason it out together. Look at the equation for Cp and the equation for Cpk do you see any values there that could help us calculate defective rate. Reply Ted Hessing says July 27, 2019 at 1127 am Thanks for the question. I've added this as a question in the Pass Your Six Sigma Green Belt question set. Sign up or log in for access. Reply Miko says February 26, 2019 at 556 am Hi. Can you use Cpk in any experiment given that the data follows a normal distribution. I am currently dealing with mixture designs. Reply Ted Hessing says July 27, 2019 at 1129 am Thanks for the question. I've added this as a question in the Pass Your Six Sigma Green Belt question set. Sign up or log in for access. Reply Naomi says March 11, 2019 at 940 am Hi Ted. Really helpful, but I think I am getting confused with Ppk, Pp, Cpk and Cp. Someone asked a question a while ago but I could not see it answered and I have had the same question in a mock that I cannot work out why the answer is as is is supposed to be. The question is What is the Ppk of a process with a spread of 24 units, an average of 68, an upper limit of 82 and a lower limit of 54. Help appreciated thanks so much. Reply Ted Hessing says July 27, 2019 at 1130 am Hi Naomi.

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