REDACTED

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Your Company Logo

#### TABLE OF CONTENTS

4.1	Statistical Process Implementation Matrix	
4.2	Statistical Process Plan	
.0 Red	quirements	
5.1	Key Characteristics	<u>,                                    </u>
5.2	Collect Data to Determine Key Characteristics	<u>.</u>
5.3	Establish Key Characteristics	<b>,</b>
5.4	Document Key Characteristics and Engineering Requirements	
5.5	Determine Process Steps Where Key Characteristics are Measured	
5.6	Select Appropriate Control Charts	
5.7	Document Process Steps, Control Charts, Sample Size and Frequency	
5.8	Collect Measurements and Maintain Control Charts	
5.9	Is the Key Characteristic in Statistical Control?	
5.10	Does the Key Characteristic Meet Minimum Capability?	
pk Ta	ble	•••••
5.11	Can Special Causes of Variation be Assigned?	
5.12	Remove Special Causes of Variation	
5.13	Collect New Measurements	
5.14	Has Gage Variation Study been Performed and Documented?	
5.15	Perform Gage Variation Study and Document Results on the Process Plan	
5.16	Was Corrective Action Taken on the Measurement System?	
5.17	Identify Potential Sources of Process Variation	
5.18	Correlate Sources of Process Variation With the Key Characteristic	
5.19	Establish Controls for Key Process Rarameters	•••••
5.20	Document Operation, Key Process Parameters, Settings and Control Method	
5.21	Update Process Database or Historical Records	
5.22	Statistically Estimating Required Samples	•••••
5.23	Evaluating Outlying Data Points	•••••
5.24	Pooled Standard Deviation	•••••
5.25	Bias Problems in Process Monitoring	•••••
5.26	Chemical Batch Process Capability	
0 Exa	ample Implementation Routine	•••••
6.1	Training Plan	
6.2	Systematic Process	
6.3	Quality Targets	
6.3	Quality Targets	

Your Company Name	REV	CAGE	DOC#:	2 of 17
			You	r Procedure #

### 1.0 Scope





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Your Company Name	REV	CAGE	DOC#:	4 of 17
			Y	our Procedure #





Your Company Name	REV	CAGE	DOC#:	6 of 17
			Υοι	Ir Procedure #

					Cpk Ta	able					
Number of Measurements			90% F	Probabil	ity That	True Cp	k Equal	s or Exc	eeds		
Taken	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2
250											9
200											
150											
125											
100											
90											
80											
70								1	1		
60								2			
50											
46								~			
42							C				
38											
34											
30											
28											
26						) ·					
24											
22											
20					<b></b>						_
<b>T</b> T1 1	• .1	1	1 1	NIC .	1 . 10	1 1		1, 1			
The values	s in the a	above ta	ble are i	the calc	ulated C	pk value	s requir	ed to be			
TT1 1	1.4.1.			1. 1 INT	1	M		7.1.1		. 1	1
The values	s listed 1	n the co		lied Nu	mber of	The teh	ements I	aken ar	e the act	tual nun	nber
of measure	ements,	not the				The tab	le assum	les			
Evamplas	• If 30	parts ar	magen	rad and	the requ	irad Col	z is 1.0	the calcu	ulated C	nk from	the
20 parts p	edetat	parts are			the requ	incu Cpi	X 15 1.0,			pk nom	
50 parts in			SL								
If attribute	data is	used th	en cana	hility is	measure	d in terr	ns of the	nronor	tion of d	efective	unite
To meet a		lent Cnl	k of 1 0	the ma	ximim s	accentah	le propo	ortion of	defectiv	res is	
										-5 15	
									Ι	f the ke	y
	Your Co	mpany	Name		REV	CAG	EDOC	`#·		7.0	of 17
			(unit					You	r Proced	ure #	
								100	110000	ы <b>с</b> II	

characteristic cannot demonstrate capability, then the next course of action is



Your Company Name	REV	CAGE	DOC#:	8 of 17
				Your Procedure #

Before investigating common cause varia	tion,		must be determined. This is done
by performing a			
5.16 Was Corrective Action Taken on	the Mea	suremen	t System?
The decision to take corrective action on	the measu	arement s	ystem is It is
suggested that the measurement system co	onsume n	o more th	nan
Corrective action	may cons	sist of	
austama includes		Types of	corrective action for measurement
Systems include:	n was tak	en the Pr	ocece Plan must be undated to show
changes New measurements must	li was tak	en, the F	occss i fan must be updated to snow
changes. New measurements must			
		<i>N</i> .	-
5.17 Identify Potential Sources of Pro-	cess Vari	iation	
Sources of common cause variation can b	e found b	by	
		Variati	on within these relevant processes
is influenced by		T	1 1
		10	ols such as
systematically identify and			should be used to
systematically identify and			This record should be available for
audit A cause and effect diagram graphic	cally port	rays the r	relationship between
adult. It cause and effect angrain graphic	carry port	iuys ine i	
5.18 Correlate Sources of Process Var	riation W	ith the K	Ley Characteristic
Based on experience, rejection history, or	other his	storical in	formation, relevant processes
should be	1 1 4 1	111	
when feasible, contro	I charts si	nould be	Elimination of out of
control conditions in processes may			Emmation of out-of-
Control conditions in processes may			
		~	
Your Company Name	REV	CAGE	DOC#: 9 of 17
			Your Procedure #

One option is to make

Such changes can

The preferred option is to use

statistically designed experiments (DOE). They are a much more powerful tool and may in the long run, cost less than the option discussed above. Experimental design is a tool suited to

Designed experiments should be conducted until

Perceived process improvements gained through experimentation should be confirmed by

If all sources of variation have been accounted for, process settings 'optimized' through statistically designed experiments, and the key characteristic is still out-ofcontrol or not capable, then the process or product is identified as

### 5.19 Establish Controls for Key Process Parameters

It is necessary to establish controls that will ensure that the **key process parameters** and their settings do not change. Controls may be in the form of

 Though control charts, in and of themselves do not

 'control' processes, they are

 By controlling these process parameters, operators can

 Your Company Name
 REV
 CAGE
 DOC#: 10 of 17

 Your Procedure #

5.20 Document Operation, Key Process Parameters, Settings and Control Method Each key process parameter must be documented on the Process Plan. The name and operation number of the pertinent manufacturing process should be recorded in the column titled Process Name and Op #. Key process parameters, their settings, and the control method used to monitor them must

#### 5.21 Update Process Database or Historical Records

orldy The results of the correlation study and data contained on the Process Plan must be placed in a permanent record system for future use. The preferred database is an automated system that is conducive to digital processing and analysis. The following data should be stored:

LII rior



# 5.22 Statistically Estimating Required Samples

When the sigma of a population is known, a means to estimate the number of samples to measure that will provide 95% confidence in the sample measurement is given by:

				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				
			_	2				
The results may be	ipling pla	an 18 deriv	ved using these	e formulas.				
•		If	a periodic mea	asurement needs to be				
made and no rationale exists to estimate th	ne sampli	ing freque	ency, then					
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Your Company Name	REV	CAGE	DOC#:	11 of 17				

Your Procedure #

#### 5.23 Evaluating Outlying Data Points

Reject outlier(s) from a set of data if  $Q_{exp} > Q_{crit}$ ; where  $Q_{exp} =$ 

[x<sub>q</sub> is the

dwide. questionable data point;  $x_n$  is the next highest data point in the set; w is the spread or range of the entire set (from W.J. Dixon, Ann. Math. Stat. 1951 - 22, 68)]

### 5.24 Pooled Standard Deviation

When a large population of samples cannot be easily obtained, an estimate of sigma can be calculated that is superior to the value from any individual subset. To obtain a pooled estimate of sigma, deviations from the mean for each subset of samples are

#### The pooled sigma is obtained by



Your Company Name	REV	CAGE	DOC#:	12 of 17
			Ŋ	our Procedure #



Your Company Name	REV	CAGE	DOC#:	13 of 17
			Your Procedure #	



#### **Systematic Process** 6.2

#### **Step 1: Identification**

orldwide. Define the process using Figure 1 and Figure 2, Statistical Process Planning Records **Step 2: Performance Measurements** 

Measure performance in quality, productivity and schedule.

Measure success level relative to time that reflects the criteria sighted in the project using a simple graph.



Your Company Name	REV	CAGE	DOC#:	14 of 17
			Your	Procedure #



Your Company Name	REV	CAGE	DOC#:	15 of 17
			Yo	ur Procedure #

			Figure 1	: SPC IIII					
10									
							0		
	2								
2									
1	Mgmt support?	Members selected?	System being developed?	Training package chosen?	Pareto's performed?	Some data analyzed?	Routing tickets used?	Supplier's providing data?	Row done
0	No knowledge	No Committee	No system	No SPC training.	No Pareto's	No techniques	No prevention	No effort	No pro- gress
			0						
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5	54								
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Your Company Name	REV	CAGE	DOC#:	16 of 17
			Your Procedure #	



Your Company Name	REV	CAGE	DOC#:	17 of 17
			Your Procedure #	



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