

A S Q STATISTICS D I V I S I O N

Newsletter ©

Volume 17, No. 2

Spring, 1998

Chair's Message

by Don Emerling



As you know, the Statistics Division has been a leader in the development of the philosophy of thought and action we call Statistical Thinking. We have sponsored presenta-

tions, seminars and short courses at AQC, FTC, and other venues. We have published a Special Publication titled "STATISTICAL THINKING."

As we continue to work toward a better understanding of what Statistical Thinking means and how to make it real, there has been more and more discussion of the relationship between Statistical Thinking and the body of knowledge we know so well — Statistical Methods. Are they independent of each other? Are they synergistic? Do they complement each other? How do they interact? Is the choice "one or the other?" If our vision is now "Statistical Thinking Everywhere" does this mean we are abandoning Statistical Methods?

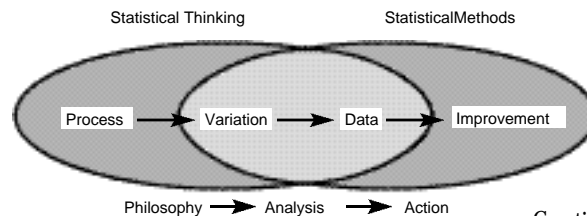
Ralph asked me to use my Chair's Message to articulate (or attempt to articulate) the interaction and interdependence between Statistical Thinking and Statistical Methods. I will discuss a belief, held by those of us who have worked on the products mentioned above, that the vision "Statistical Thinking Everywhere" incorporates the interaction and strong interdependence between the philosophy of Statistical Thinking and the body of knowledge called Statistical Methods.

The diagram below, developed by Ron Snee and Roger Hoerl, demonstrates the interdependence between Statistical Thinking and Statistical Methods. There is a natural left to right flow to the diagram. An improvement activity should start with the **Philosophy** and first principle of Statistical Thinking: "All work occurs in a system of interconnected processes". First identify the process or processes involved in the activity and the inputs, activities, and outputs to be studied.

Then the activity flows naturally into **Analysis**, which combines the next two principles of Statistical Thinking ["Variation exists in all

processes" and "Understanding and reducing variation are keys to success"] with the methods and tools of Statistical Methods. This is where the strong interaction and interdependence between Statistical Thinking and Statistical Methods is most evident. As you identify the key performance metrics of the process and the critical needs of customers and suppliers, statistical tools such as run charts, scatter diagrams, control charts, and other tools become important. And statistical methods, such as experimental design, become important.

As activity moves toward **Action**, Statistical Methods now become the more dominant focus. Action plans are



Continued on page 2



Inside This Issue

Chair's Message	p. 1
Mission, Vision, etc.....	p. 2
Editor's Message	p. 3
Help Wanted.....	p. 3
Letters to the Editor.....	p. 4
Tribus/Deming Lecturer	p. 9
Membership Report.....	p. 9
Section Liaison Corner	p. 9
Annual Quality Congress	p. 10
AQC Workshop.....	p. 11
AQC Booth Activities.....	p. 11
Birth of Stat Division	p. 11
Fall Technical Conference.....	p. 12
FTC Scholarships	p. 12
Other Conferences.....	p. 13
Stat Division Speakers List	p. 14
Mini-Paper (Risk Assessment)	p. 15

EDITOR'S MESSAGE

Continued from page 1

developed to use the tools and methods of statistics to create rapid improvement and those tools and methods continue to be used to track performance.

I asked Lynne Hare, a former Statistics Division Chair and an author of the Special Publication on Statistical Thinking, for his thoughts on the interrelationship and interdependence between Statistical Thinking and Statistical Methods. Here is his response:

1. The use of statistical tools is greater and of higher quality in a Statistical Thinking (ST) environment. ST provides suction for statistical tools. Back in the early stages of my career, I became frustrated with the lack of use of statistical tools. While seeking root causes, I learned that managers would not allow workers to use tools that they (the managers) did not understand. For

managers to acquire understanding, they had to see the advantages. That, in turn, required understanding of variation and the process view. It took a long time, but I was able to change organizational culture to one in which there was a better understanding of the process view and the accompanying variation, whose understanding affords an opportunity for improvement. Only then was I successful at getting increased use of statistical tools - simple tools at first and, with increased understanding, more advanced tools.

2. One can engage in ST without data. Ron emphasized that it is possible to engage in ST without data. For example, you don't need data to know that a reduction in the number of suppliers will reduce the variation in your finished product. Sometimes, when you don't have data, you have ideas instead. For example, affinity mapping clusters ideas, a very statistical thing, without data in the traditional'

Continued on page 3

Disclaimer

The technical content of material published in the ASQ Statistics Division Newsletter may not have been refereed to the same extent as the rigorous refereeing that is undergone for publication in **Technometrics** or **J.Q.T.** The objective of this newsletter is to be a forum for new ideas and to be open to differing points of view. The editor will strive to review all articles and to ask other statistics professionals to provide reviews of all content of this newsletter. We encourage readers with differing points of view to write to the editor and request an opportunity to present their views via a letter to the editor, as was done in the past issue. The views expressed in material published in this newsletter represents the view of the author of the material, and may or may not represent the official views of the Statistics Division of ASQ.

Criteria for Basic Tools and Mini-Paper Columns

Basic Tools

Purpose: To inform/teach the "quality practitioner" about useful techniques that can be easily understood, applied and explained to others.

Criteria:

1. Application oriented/not theory
2. Non-technical in nature
3. Techniques that can be understood and applied by non-statisticians.
4. Approximately three to five pages or less in length (8 1/2" x 11" typewritten, single spaced.)
5. Should be presented in "how to use it" fashion.
6. Should include applicable examples.

Possible Topics:

New SPC techniques
Graphical techniques
Statistical thinking principles
"Rehash" established methods

Mini-Paper

Purpose: To provide insight into application-oriented techniques of significant value to quality professionals.

Criteria:

1. Application oriented.
2. More technical than Basic Tools, but contains no mathematical derivations.
3. Focus is on insight into why a technique is of value.
4. Approximately six to eight pages or less in length (8 1/2" x 11" typewritten, single spaced.) Longer articles may be submitted and published in two parts.
5. Not overly controversial.
6. Should include applicable examples.

General Information

Authors should have a conceptual understanding of the topic and should be willing to answer questions relating to the article through the newsletter. Authors do not have to be members of the Statistics Division.

Submissions may be made at any time to the Statistics Division Newsletter Editor. All articles will be reviewed. The editor reserves discretionary right in determination of which articles are published.

Acceptance of articles does not imply any agreement that a given article will be published.

VISION

- Our customers' needs will be continuously anticipated and met.
- Our members will be proud to be a part of the Division.
- Our Division's operations will be a model for other organizations.
- We will be a widely influential authority on scientific approaches to quality and productivity improvement.

MISSION

- Promote statistical thinking for quality and productivity improvement.
- Serve ASQ, business, industry, academia and government as a resource for effective use of statistical methods for quality and productivity improvement.
- Provide a focal point within ASQ for problem-driven development and effective use of new statistical methods.
- Support the growth and development of Division members.

STRATEGY

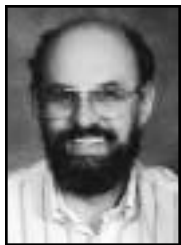
- Our primary customers are Statistics Division members. Other key customers are:
 - Management,
 - Users and potential users of statistical methods for quality and productivity improvement,
 - Educators of the above customers.
- Our orientation to customers is customer focused.
- Our markets, within which we intend to offer products, are weighted as follows: greatest weight on intermediate statistical methods, nearly as much weight on basic methods, and much less weight on advanced methods.
- Our primary products are educational services.

PRINCIPLES

- Focus on a few key things.
- Balance short-term and long-term efforts.
- Recognize that we exist for our customers.
- Value diversity (including geographical and occupational) of our membership.
- Be proactive.
- View statistics from the broad view of quality management.
- Apply statistical thinking ourselves (that is, practice what we preach).
- Uphold professional ethics
- Continuously improve

Editor's Message

by Ralph St. John



Well, I've gone through the third cycle of putting out the Newsletter – it's still fun. I've accumulated a lot of mail, especially since the Winter 98 issue was so full that we didn't print any letters to the editor. In this issue there are many letters on various topics. In some cases the writer is making a comment; in other cases the writer is looking for help. I will include email addresses or postal addresses with each letter so that readers may communicate directly with the writer. If you reply to questions posed in the newsletter, please copy me, and we will acknowledge your responses in the newsletter.

Since I have asked you to write, I have an obligation to respond. Sometimes I do that quickly, sometimes slowly. If you don't hear from me, try again. There are areas where we won't be able to help you. We've had to work out some policy issues regarding what does and doesn't go into the Stat Div Newsletter. Unless things change we will follow this policy:

1. Job listings will not be posted in the Stat. Division Newsletter. Why not? If we accept these postings, then we must accept from everyone, including job placement agencies (headhunters). We could easily become inundated with such postings and become a free advertising medium for headhunters. Unless someone has a better idea, we will resolve the issue by not posting job openings. Some of you may not be aware that ASQ Net has a career services area on the ASQ Web Page. To access that site go to <http://www.asq.org/pls.shtml>. Please write if you have a better idea.

2. Web sites which are fully or partially intended to be profit generating pages will not be listed in the newsletters' web page column, unless they are part of a larger story. That is, if the newsletter is doing a story on design of experiments, we may mention a web page which offers paid consulting assistance on design of experiments. But if you write to the newsletter asking us to post your web page URL (address), we probably won't do it. The rationale is similar to the one given for posting job openings: the Stat Division Newsletter should not be free advertising space for for-profit entities.

Keep those cards and letters coming. See you in Philadelphia at the AQC!

CHAIR'S MESSAGE

Continued from page 2

numbers' form. The left ellipse in the diagram may not necessarily include data. Essentials of ST are the process view and variation.

I hope this discussion has helped you understand the strong interdependence between Statistical Thinking and Statistical Methods. I also hope that in some small way it helps each of you as you face the challenge of

helping your business or organization be successful.

The challenge is new. The challenge is certainly different; we have to add methodologies and tools to our knowledge base that are not 'statistical science', such as team tools, teamwork skills, "idea data" tools and methods. But the members of the Statistics Division are a diverse lot. We are not exclusively "statisticians"; our members, and the focus of our Division, are interested in practical applications

of statistical methods and statistical thinking. Let us demonstrate to the leaders of corporate America the critical need for statistical thinking and statistical methods to become a fundamental part of leading their enterprises to success in the next century.

As Bill Hunter said seventeen years ago, "...we should try to be a positive catalyst for a general move in this desired direction." "If we don't try, who will?"

Help Wanted

1. Statistical Clearinghouse

Help is needed to create the ASQ Statistics Division Statistical Clearinghouse. The Statistical Clearinghouse is a website under construction that will provide members and others with information to help them get answers to frequently asked statistical questions such as:

- What Publication?
- What Software?
- What Events?
- How Do I?
- What is the Meaning?

We are looking for a few **volunteers** to provide short reviews and/or commentaries on statistical publications and software. These reviews will be included on the website to provide guidance for those attempting to select an appropriate publication or software product. If you are interested in helping, please contact Marcey Abate (505-844-9424 or mlabate@sandia.gov).

2. Assistant Newsletter Editor. Can you write well? Can you organize other peoples' work? Do you want to help post newsletter articles on the Web Page? Would you like to help improve the product you're reading right now? Please contact Ralph St. John (rstjohn@cba.bgsu.edu or 419-372-8098).

3. Assistant Webmaster. Do you use the Web? Do you know HTML and JAVA (or would you like to learn)? Have you visited our Web Page at <http://www.asq.org/StatDiv/>? Do you want to help improve the home page? Please contact Mark Kiel (markHK5409@aol.com or 708-841-0661).

4. Section Liaison. Do you belong to a section? Do you want to help your section learn more about Stat Division activities and products? Are you interested in helping the Stat Division learn more about the needs of your section? You could be a Section Liaison! Contact J.L. Madrigal (madrigal@byu.edu or 801-378-7357).

4. 1999 Annual Quality Conference. We need volunteers to act as Paper Reviewers and Session Managers. Please contact Beth Propst (Alpropst@aol.com or 630-443-8213).

LETTERS, LETTERS, WE GET LETTERS

To the Editor:

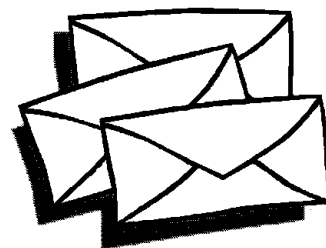
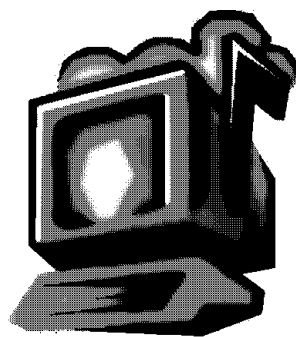
I read your article in the Fall 1997 Statistics Division Newsletter and found it most interesting. I support your idea that having a resource to submit questions to would be very good. I am writing because I found the **news-group references** that you listed very interesting. I have been looking for an internet resource of this type to ask some statistical questions. My Primary question is that you listed "sci.stat.consult" and "sci.stat.math". How do you access these? I tried to enter just as they are listed and it returned a comment about not being able to connect to host.

I am a Quality Director at a 250-person company. We are a manufacturing company and apply many statistical concepts, but many times I would like to have access to something that can provide feedback on how to apply and interpret a statistical concept. We work with common things such as SPC, t-test, f-test, required sample size, and design of experiments.

We most recently noticed that our tensile test data were not normally distributed so we have been struggling with how to interpret and apply the data. We base our capabilities and print specification on a 6-sigma spread. I have been working with the statistical software people on how to interpret their software and determine if the data are normal. If you could give any feedback on how to determine if data are normally distributed and, if not, how they should be treated to determine process capability and the application of the data with a t-test.

I would also like information on how to apply t-test, f-test and chi-square. Primarily how to set up the equation for t-test (2 mean, equal variance t-test, paired t-test or students t-test) and how to interpret or apply the hypothesis if the test is a left tail, right tail, or two sided test. How to accept or reject the hypothesis. My e-mail address is.....

Editor's note: For confidentiality reasons the author's name has been omitted. I responded briefly to the author. However, this letter suggests the need for an article on how to use web resources (newsgroups, WWW, email, etc) for statistical/quality applications. Is anyone out there interested in writing a 2-3-page tutorial on this subject?



To the Editor:

A brief comment regarding the mini-paper entitled "**To Randomize or not to Randomize, that is the Question**" by M. Hwan (LSI Logic), which appeared in the Winter, 1997 Statistics Division Newsletter.

With my first pass through this paper I agreed with the author's presentation and conclusions. Days went by before I realized the missing "Golden 3R Rule of Statistics"replicate, replicate, replicate. This is especially true of small designs where high-order interactions aren't available to assign a drift variable. With replication and with ...you guessed it... randomization, drift external to the experiment won't coincidentally attach itself to one of the effects the experimenter is attempting to measure.

Loren Hiatt
lehiatt@imation.com

To the Editor:

I have just read the interesting **minipaper on randomization** by Marilyn Hwan in the Winter 1998 Statistics Division Newsletter. She makes a very good point. We can carry her ideas a little further.

Table I below shows three sequences, each of which has three main effects clear of (uncorrelated with) time. In the first sequence the AB interaction is also clear of the drift, but the other interactions are not. In the second AC is clear; in the third BC is clear. Some readers may prefer the third sequence because in it the ABC interaction is at its high level in the last four points and at its low level in the first four, giving ABC the largest correlation with time.

The rationale for finding these sequences is the following. There are eight points and $1+2+\dots+8=36$. Suppose that we start a sequence with the base point $(-, -, -)$, and that we want to construct a sequence in which A is orthogonal to a linear time trend. We want A to take its high level at points which add up to $36/2=18$. This can occur if we choose the points in four ways: 2, 3, 6, 7 (as

Continued on page 5

LETTERS, LETTERS, LETTERS

Continued from page 4

in sequence I); 2, 4, 5, 7 (B in sequence I); 2, 3, 5, 8 (as in sequence III); or 3, 4, 5, 8 (C in sequences II and III). In sequence III, A is also orthogonal to a quadratic trend in time.

The idea of running the points of a factorial in a prescribed sequence instead of in a random order has been discussed over the years in three articles in *Technometrics*: Hill (1960), Daniel and Wilkinson (1966) and John (1990). All three articles contain discussions on running the sixteen points of a four factor experiment.

Table 1
Three Sequences

I			II			III		
A	B	C	A	B	C	A	B	C
-	-	-	-	-	-	-	-	-
+	+	+	+	+	-	+	+	-
+	-	+	+	+	+	+	-	+
-	+	-	-	-	+	-	+	+
-	+	+	-	+	+	+	+	+
+	-	-	+	-	+	-	-	+
+	+	-	+	-	-	-	+	-
-	-	+	-	+	-	+	-	-

Sincerely,
Peter W.M. John
PWMJ@math.utexas.edu

References

- Hill, H.H. (1960) "Experimental Designs to adjust for time trends", *Technometrics*, 2, 67-82.
Daniel, C. and F. Wilkinson (1966) "Factorial 2^{p-q} designs robust against linear and quadratic trends" *Technometrics*, 8, 259-278.
John, Peter W.M. (1990) "Time trends and factorial experiments", *Technometrics*, 31, 275-282.

Response from Marilyn Hwan:

Thanks to Peter and Loren for their comments. One of the major points I tried to make is that we cannot say we randomize the run order if we choose to eliminate some of the resulting orderings as undesirable. I apologize if I did not say that strongly enough.

Even if we replicate, there are orderings which confound time trend with main effects, and we would likely remove those orderings from consideration. For example, in my eight run design, if we replicate then randomize the 16 runs, it is possible that the first eight runs will have factor A at the + level and the last eight will have A at the - level. Replication does not solve the time trend con-

founding problem. Thanks to Peter John for his ideas on carrying these notions even further, and thanks for the reference as far back as 1960.

Hopefully this article has whetted the readers' appetite and they will question whether randomizing is **really** the solution to their problems.

Marilyn Hwan
Mhwan@lsil.com

To the Editor:

I would like to add my comments to the recent discussion on the **exponentially weighted moving average (EWMA)** in your newsletter. Contrary to statements made by Sumedha Sengupta in her response letter to Bill Woodall, the EWMA is applicable for monitoring a process that produces independent observations. In fact, EWMA control charts may be used to monitor a process in any situation where a Shewhart chart can be applied. In comparison to Shewhart charts, EWMA control charts are faster at detecting small or moderate (persistent) shifts in the process (mean). In this regard EWMA charts are similar to Cumulative Sum (CUSUM) control charts. For more details on the EWMA control chart see Montgomery (1991). The confusion as to whether the EWMA is applicable or not probably arises since, when the data are independent the EWMA will not provide a good forecast of future values. However, in the monitoring application we are not attempting to forecast, rather, through the EWMA we accumulate information from past observations to determine if there is any evidence of a process shift. As a result, in monitoring applications of the EWMA the weight factor (gamma) is determined not based on a criterion such as the minimum mean square error, but rather based on the desired operating characteristics of the corresponding EWMA chart. For monitoring, small values of gamma, such as 0.2, are typically used. This choice yields EWMA charts that are good at detecting small persistent shifts.

Stefan Steiner
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Reference

- Montgomery, D.C. (1991), *Introduction to Statistical Quality Control*, Second Edition, John Wiley and Sons, New York.

Continued on page 6

LETTERS, LETTERS, LETTERS

Continued from page 5

Editor's comment:

We have heard pros and cons on this issue. It appears that Dr. Sengupta has identified a use for the EWMA charts which could be useful, but her use of the EWMA limits may not correspond to the original intent of those limits. If there is 'general' agreement that the purpose may be appropriate, then might this be a case where the development of 'better' limits would follow from the application showing the need of such limits? To paraphrase Dr. Sengupta "For lack of 'better' limits, why not use these for monitoring purposes, while acknowledging that these may be less than perfect, but they are the best we have?" In any case, I would ask that those who wish to continue this discussion do so 'off-line' (i.e. not in the Stat Division Newsletter).

To the Editor:

This regards the "Letter from Bill Woodall" discussion about refereeing that appears on page 19 of the Statistics Division Newsletter, Winter 1998. First, let me say that I am all for **manuscripts being refereed**. It is not always appreciated that refereeing has two purposes, namely, (1) to protect readers from material that is poorly written and/or wrong, and (2) to protect authors from the embarrassment of appearing ignorant and/or incompetent.

The newsletter is significantly weakened by the **Disclaimer** appearing on page 2. It says, in effect, that the editor will "strive" to get "not rigorous" reviews of manuscripts, etc. For those who believe that reviewing (refereeing) is the only way to go, this is too weak a statement. It can be translated to: The following disclaimer allows the editor to decide whether or not to have submitted manuscripts refereed, and to be protected in the event that inaccurate or wrong material is published.

Do you really believe that this is the way to run a publication containing material that is aimed at thousands of readers, many of whom are beginners? Surely not. Dump the Disclaimer (including its title, but keep the last sentence). Get manuscripts properly refereed. Sleep better.

Lloyd S. Nelson
17 Jefferson Dr.
Londonderry, NH 03053-3647

To the Editor:

Just received the Fall 97 newsletter. Excellent! One suggestion: is it possible to have your web spinning **article put on your home page** then we can access all the sites with ease? Thanks.

Tom Sutton
suttont@operatns.mohawkc.on.ca

Tom:

Once the new Statistics Division Web Page is up (it will be by the time you read this), we will begin posting on the web page all of the 'technical' articles from past newsletters. So, Youden Addresses, Minipapers, Tutorials, and other articles like you mention will be posted at <http://www.asq.org/statdiv/>

Editor

To the Editor:

In the **Summer 1997 issue of the ASQ Stat Division Newsletter, the article on "Basic Tool"** has a serious mistake and some limitations that should be pointed out. First, the Xbar chart shown in Fig. 1 on page 6 is NOT in statistical control; the last ten points are a statistically significant sequence or run of data, clearly showing that the process mean has undergone a sustained shift down, i.e., a decrease in the bond strength. Thus, a process capability study is not valid, and the process needs to be brought into statistical control. This should have been investigated after a run of 7 or 8 points, as is usually recommended.

Secondly, the constants for constructing control charts are based on at least 30 sample points. The XMR Chart, Fig. 2, on page 7, has only 8 points, and the limits should be calculated using d_2^* for $k=7$ and $n=2$, and not d_2 for $k=30$. It's not a good teaching or learning situation when a control chart with only 8 points is shown, although the philosophy behind the chart of plotting Cpk's is excellent. Good practice would require that a normal probability plot of the data be constructed, since an assumption in constructing the individuals control chart is normality of the data.

Don Ermer
ermer@engr.wisc.edu

LETTERS, LETTERS, LETTERS

Continued from page 6

To the Editor:

I would appreciate if you advise me on the following question: How do I pick the **right sample size** that would provide me with an assurance at 95% confidence level that 99% of the population would **lie well above the minimum specification?** The data is variable and it is a one sided specification situation (LSL). Can I use this formula,

$$X(\text{lower}) = \bar{X} - K \cdot \sigma$$

to work out K, and then go to tables to find the corresponding n? Where X is the lower spec, Xbar is the historic mean on the characteristic, the K factor for a given Confidence level and percentage can be found from the tables, sigma is the historic std. dev. on this subject characteristic, and n is the sample size.

Is this the right way to work out the sample size for this situation? Please advise. Looking forward to your advice and guidance on this. Congratulations on taking over the editorship of the Statistics Division Newsletter!

Harbant Grewal
hg@heartport.com

Harband:

If I correctly understand your letter, then what you are looking for does not exist. Examples may be appropriate to illustrate. First, if the lower spec is 10 and the historical mean is 9.5, with standard deviation of 1, then there is no sample size which can save this disaster — you are making out-of-spec parts. Similarly, if the lower spec is 10, and the historical mean is 10, then 50% of the product is below spec, regardless of sample size. Increasing the sample size 'narrows diversity' in Xbar, but not in the characteristic of interest (say X). That is, changing sample size changes the variance of Xbar, but NOT the variance of X (the population characteristic). Spec limits refer to the distribution of X, whereas control limits for Xbar charts refer to the distribution of Xbar (and do change as the sample size changes). The population standard deviation is fixed and doesn't decrease with an increase in sample size.

Editor

To the Editor

As a new member of the Statistics Division, I would like to express my pleasure with my first issue of the Statistics Div. Newsletter. The information and format is exactly what I've been looking for. I have become very interested

in statistics, especially probability and risk – those discussed in the mini paper by Dennis King. His discussion and examples will be devoured for months to come!

You asked for comments regarding a "HOW DO I...?" column and Dr. King's article led me to pose this question: **How do I calculate the standard normal table values myself (on my computer)?** I have tried (without success) to do so, and have fallen back to look-up Z tables and/or calculators. If this is the kind of question for your new column idea or perhaps a mini paper, I would sure appreciate some help walking me through the process. I have found that going through the actual expression helps me to understand the significance and limits of a statistic.

Thanks again for a great newsletter, as I will be looking forward to each and every issue.

Robert L. Watkins
magsearch@compuserve.com

Bob:

After some searching around on the internet, I have found a couple of FORTRAN 'freeware' subroutines for calculating normal probabilities. I am sending these to you via email. Let me know if this does the trick. I am also sending you a general purpose 'probability' calculator which can reside on your desktop; it calculates probabilities and inverse probabilities for various distributions. This is also freeware which I found on the internet. Perhaps a tutorial on searching the internet, downloading and using freeware would be of interest to readers? Any reaction?

Editor

To the Editor:

I just wanted to congratulate you on your first edition of the ASQ Statistics Newsletter (Fall 1997). I thought your article on statistical web sites was very useful, and the announcement of the NIST web page with Standard Datasets was met with keen interest among some of my coworkers. One thing that was EXTREMELY useful was putting the URLs in bold type, making it very easy to pick them out of the background text. That technique is something you should continue in your future web articles. I will let you know if I find any good sites!

Continued on page 8

LETTERS, LETTERS, LETTERS

Continued from page 7

I am a Quality Engineer working in the medical electronics industry, with responsibilities concentrated on new product qualification, investigating customer complaints, tracking field reliability, and driving corrective action. I generally struggle with statistical concepts, don't find anything intuitive above statistics, and constantly find myself stopping to ask what a particular result is telling me. This is a round about way to indicate my support of the division strategy to offer equal amounts of basic and intermediate methods. **I particularly enjoy the Basic Tool articles and hope to see more in the future.** In my opinion, the advanced stuff belongs in Technometrics.

Now back to your newsletter. I also liked your idea of including a 'How Do I' column, for some of us 'statistically challenged' individuals. To that end, here is a question: **when specifying the number of devices to test during New Product Qualification, how do I pick a quantity which is 'statistically significant'?** Early prototypes and verification test articles are generally expensive and hard to get, so we are constantly battling and negotiating for units. During new product development we generally build around 10 prototypes, with another 15 to 20 verification units, and finally another 20 to 30 validation units. In production, normal volumes of a given model range from 600 a year, up to 2000 a year.

Looking forward to more great editions of your newsletter.

Gary Gross
ggross@corp.atl.com

Gary:

Thanks for your kind works about past newsletters. I hope we continue to live up to your expectations. With regard to your sample size questions, I will first refer you to a series of booklets published by the Statistics Division through ASQ's Quality Press. The series is called the 'How to....' series, and gives introductory coverage of a number of statistical methods, primarily in a basic tutorial or case study approach.

Volume 12 in that series is titled "How to Choose the Proper Sample Size". The author is Gary Brush. The booklet is item number T3512 in the Quality Press catalog. I think you'll find this usefull.

Editor

To the Editor:

I read in the Stat Division Newsletter that you are starting a 'How do I ...' column. Here are my Questions:

1. How do I rate designs? (CP, Cpk level, Sigma Level, 1st time yield)
2. How do I design for 6 sigma; Manufacturing; Assembly?

Hope you can help with the questions.

Mike Verdecchio
mverdecc@motown.lmco.com

Mike:

These two 'simple' questions could fill a book. Any of our readers want to give Mike some direction on this, maybe a short reading list would be appropriate?

Editor

To the Editor:

I read Frank Matejcik's minipaper on "Graphical Supplements" in the Winter 98 Statistics Division Newsletter with great interest. I am currently teaching a Quality Engineering class and also teach SPC classes. In each of these classes I am called upon to teach the basics of statistics (i.e. measures of central tendency and measures of variation). I have had some students that respond well to traditional methods and others that do not. This is especially true of teaching standard deviations.

I believe that this methodology would be of tremendous use to me and would like your permission to use the methodology and the paper in my classes. Would that be possible?

I was not sure of the "ownership" of this paper, so I also emailed the author, asking for his permission to use the information. I appreciate your help with this.

Duane A. Floyd
DFloyd@technimark.com

Duane:

Get the 'ok' from Matejcik and acknowledge the source of the material (Stat Division Newsletter), and you'll be all set. Just don't make large quantities of copies for sale.

Editor

Tribus Named Third Deming Lecturer

Myron Tribus was chosen to give the third annual Deming Lecture at the Joint Statistical Meetings in Dallas on 11 August 1998. Dr. Tribus' work has been profoundly influenced by Deming's quality management philosophy since they met in the late 1970s when Tribus was Director of the Center for Advanced Engineering Study (CAES) at MIT.

Tribus, retired from MIT in 1986, is a Quality Management consultant. Prior to MIT he was Senior V.P. at Xerox and, earlier, Assistant Secretary at the Dept of Commerce (2 years).

Previously, Tribus was Dean of Engineering, Dartmouth College (8 years). Earlier, he was on the faculty at UCLA (16 years) and the University of Michigan (2 years).

Tribus published many papers on topics ranging from probability theory, statistical inference, and thermodynamics, to sea water demineralization, aircraft ice prevention, and engineering curriculum design. He published two books, "Thermostatics and Thermodynamics" and "Rational Descriptions, Decisions and Designs" (which introduced Bayesian Decision methods to engineering design). He worked with Irving Langmuir in the early days of cloud seeding and statistics in weather modification.

A member of the National Academy of Engineering and recipient of two honorary degrees, he received the BS (Chemistry) from California, Berkeley, and the PhD (Engineering) from UCLA.

Recently, Tribus became known to the quality community through his writings and his work with schools and community quality centers, all based on Deming's philosophy of management.

His lecture will describe the transformation that Deming's teachings have brought about in some schools, beginning with one in Alaska in the 1980s and spreading as far as Tasmania and Latin America. The greatest strides have been made in the lower grades.

Section Liaison Corner

In a previous newsletter we told you about the Section Liaison (SL) position. What reasons led to this new position? The Division officers believe that members will be better served by having a local representative (SL). One of the responsibilities of the SL is the organization of informal meetings of the Stat Division members in his (her) section. The purposes of these meetings are networking, sharing of statistics work experiences, question & answer sessions, socializing (this is important in developing cohesiveness), etc. The SL can also assist in bringing statistics

programs to section meetings. These activities will promote cohesiveness within the local section. An attractive feature of these meetings is that their frequency is decided by the members of the local section.

We currently have 14 section liaisons in 13 states. Periodically, in the newsletter, we will share some of the exciting statistical activities that are going on in different ASQ sections. We encourage you to become involved in statistical activities with your section liaison. If you wish to volunteer to serve as a Section Liaison, please contact JL Madrigal (email: madrigal@byu.edu, Phone: (801) 378-7357, Fax: (801) 378-5722). Make a difference; Join our team!

JL Madrigal, Membership Chair

Membership Report - Oct- Dec 1997

The total number of members in the Statistics Division for the last quarter of 1997 was:

Month 1997	Total No. Members	% Variation 1996-1997
October	9831	-.043
November	9964	-.045
December	10048	-0.47

It appears that the Stat Division will end the 1997-1998 year in June 1998 with a 1% -2.5% reduction in number of members. This projection is based on the time series model that was developed using our membership data since May 1990. It is important to note that the Statistics division retention rate is similar to that of other divisions. Currently, the membership committee is working on developing a new 'program' designed to help members new to the division. In addition, the creation of the Section Liaison position will help promote cohesiveness among all members who are active in a section. See 'Help Wanted' ads for more information. Lastly, I would like to express my appreciation to the new members who have answered the questionnaire included in their "welcome" package. Thanks for your comments and suggestions.

JL Madrigal, Membership Chair



American Society for Quality 52nd Annual Quality Congress May 4-6, 1998, Philadelphia, PA

The Statistics Division will be very active at the AQC in Philadelphia. From an educational perspective, we are involved in two major activities.

First, Tim Fuller is teaching a Pre-conference Course on Sunday, May 3, titled **"How to Use Theory of Constraints to Improve Work Flow"**. See the write-up elsewhere in this newsletter.

Secondly, at 1:30 p.m. on Monday, May 4, the Statistics Division presents a session (M107) titled **"The Multi-Variate Nature of Statistical Thinking"**. The presenters are Stu Hunter, Nouna Kettaneh-Wold, Theodora Kourti, Robert Mason, Svante Wold and John Young. **[Editor's note:** Presenters include people who are strong in multivariate analysis and people who are strong in explaining statistics to the layman. We can expect a presentation which makes available to attendees the strength of multivariate analysis, explained so that the statistical layman can understand, and these analysis procedures tied into the statistical thinking approach to problem solving.] Session Manager is Richard Kleinknecht.

"Participants will leave this session with theory and applications of various multivariate data analysis techniques including unique uses of Hotelling's T^2 as well as emphasize projection to latent structure (PLS) procedures."

Other AQC Activities of the Stat Division

1. The hospitality suite in the Marriott will be open nightly from Sunday until Tuesday. Come enjoy a drink, meet the officers, discuss Stat Division initiatives, offer to help, network, or just plain relax. Watch the bulletin board at the registration desk for location and times. See you there!!
2. The Statistics Division Booth will be set up in the Exhibit Area. Our focus is on celebrating our 20th anniversary (see the history article elsewhere in this newsletter). We will feature each of the past Chairs of the Stat Division, and the accomplishments of each of them. Quizzes, games, door prizes (see attached article)...all geared to attract you so you can tell us what you want and expect from the Statistics Division.

Statistics Division Meetings at the AQC

The Statistics Division will hold a number of meetings during the AQC. Members of the Division are invited and welcome to attend any of these meetings. If you're interested in working to better the Division, please come and express your interest and your views. Meeting locations will be posted.

1. Statistics Division Newsletter Committee. Sunday, May 3 from 2 to 4 p.m. We are looking for assistant editors in these areas: 1. Electronic (web page) publishing; 2. Minipapers and Tutorials; 3. Officers' reports; 4. Education activities; 5. Conference reports. Come join us to improve your newsletter.
2. Sunday, May 3, 6:30 to 8:30 p.m. ASQ Welcome Reception. Come meet fellow division members.
3. Statistics Division Business Meeting. Sunday, May 3, 8:30 p.m. This is another opportunity for the Stat Division leaders to listen to the members' views. Division leaders will discuss recent activity toward upgrading the vision, mission, principles and strategies. Also, implementation of these would flow through a newly re-focused Strategy Committee. If approved, these changes should help the Division focus on one common theme for all of its activities. Come tell us what you think.
4. Statistics Division Council Meeting. Monday, May 4, 7-9 p.m. Officers and committee chairs will review the outcomes of the Tactical Planning Meetings and the Business Meeting.

AQC '98; Workshop on Improving Work Flow

Do you know there are two types of important process variation: 1) variation in the quality of the output; and 2) variation in the quantity of the output? Do you know how to manage component processes so that quantity of the output is increased? Do you know how to apply Theory of Constraints to focus on those processes that are bottlenecks? If you answered 'no' to any of these questions then do not miss the Statistics Division sponsored workshop at AQC. The workshop is titled "**How to Use Theory of Constraints to Improve Work Flow**" and will be taught by Tim Fuller.

The workshop will consider the difficulties of managing production, and also discuss the feasibility, cost, and time of overcoming these difficulties. Interactive simulation exercises and case studies will be used to identify fundamental causes for organizations not achieving needed system output. Further investigation of simulations will demonstrate how managers are forced to compromise between meeting customer requirements and minimizing costs, and the impact on output if every manager is trying to individually maximize efficiency measures. Solutions to these problems will be derived by demonstration of the Theory of Constraints using a five-step focusing process. Workshop participants will learn how to identify and exploit the constraints in a system.

The course is scheduled from 8:30 a.m. to 4:30 p.m. on Sunday, May 3, 1998, the day prior to the AQC. The course fee is \$300. Enrollment is limited to 75. Sign-up for tutorial #CA 1398, along with your 1998 AQC registration.

Statistics Division AQC Booth Activities

This year we are celebrating our 20th Anniversary as a division. This is cause for celebration! As we approach the 21st century, we are getting ready to continue strengthening our relationship with all of the members of the Statistics Division. One of the main activities at our AQC Booth will be a **Jeopardy** game specially designed for your enjoyment. Check your knowledge of statistical thinking, quality philosophies, statistical methods, or a day in the life of former Statistics Division chairs? **Come join**

us! Will Vana White be there? We guarantee (with 95% confidence) you will enjoy the experience. Door prizes! Prizes for playing! By the way, there are rumors former Statistics Division Chairs will be dancing the Macarena!!!

In addition to these activities, we will be recruiting section liaisons, volunteers to work on the web page, the newsletter, the education committee, etc. If you want to help, come join us! If you like to party, come join us (Happy 20th, Stat Division!). Well, my dear friends, we look forward to seeing you in Philadelphia.

JL Madrigal, Membership Chair.

The Birth of the Statistics Division

Since the Statistics Division is celebrating its 20th birthday this year, I thought it would be interesting to go back to the first newsletter to read about the founding of the Statistics Division. Thanks to Barbara Ferraro, the first newsletter editor, that issue has lots of historical information worth recounting.

Prior to the founding of the Statistics Division, most people in ASQC with a statistics interest belonged to the Chemical Division (now Chemical and Process Industries Division). At that time the only formal 'statistics' group within ASQC was the Statistics Technical Committee (STC), which primarily concerned itself with statistical standards such as MIL-STD, ANSI, etc. As early as 1974 (at the ASQC national meeting in San Diego) Richard Freund saw the need for a broader and more visible role for statisticians within ASQC and he 'campaigned' for the formation of the SD, beginning at the 1975 Fall Technical Conference in Richmond. By 1977 (at the ASQC national meetings in Philadelphia) Wendell Paulson, then chair of the STC, had begun circulating petitions and had written bylaws and other documents which lead to the formation of the Statistics Division. Was Philadelphia (home of the 1998 AQC) the birthplace of the Stat Division? Finally, the last necessary signatures were obtained at the ASQC national meeting in Houston in 1979, and the Statistics Technical Committee officially became the Statistics Division.

The first meeting of the Statistics Division was held at the 1979 FTC. Bill Hunter chaired it, with 27 people in attendance. Topics discussed included:

Continued on page 12

STATISTICS DIVISION BIRTH

Continued from page 11

1. A review of the history of the founding of the SD, by Bill Mead.
2. The role of the SD, and its relationship with the Chemical Division.
3. A Reference Series was begun, which evolved into the 'How To' series. The first booklet in this series, written by Wayne Nelson, appeared in early 1979. It was titled "How to Analyze Data with Simple Plots".
4. The Statistics Division took ownership of the Glossary, which we continue to edit today.
5. Statistics Division sessions for the 1980 national meeting in Atlanta were ready. Our first short course would be presented by Ken Stephens, on the topic "How to perform continuous sampling." This would later become Volume 2 in the "How To" series.
6. Acknowledgement was made of Chem Division's many years of support for the formation of SD, and of the \$2,000 donation of 'seed money' from the Biomedical Division.

The first newsletter also carried a congratulatory message from Phil Crosby, then ASQC president. He especially emphasized SD's commitment to the "How To" series, and the statistical service that members of SD perform for the entire quality profession.

Officers of the Statistics Division:
William G. Hunter, Chairman
Otto Dykstra, Jr., Chairman-Elect
Wendell F. Paulson, Treasurer
Duane Dietrich, Secretary

Members of the Advisory Board: George Box, A.J. Duncan, Dick Freund, H.O. Hartley, John Hromi, Stu Hunter, Norman Johnson, Bill Lawton, Fred Leone and Lloyd Nelson. Talk about an all-star lineup!!!

Regional Councilors during the first year included Jim King, Bovas Abraham, Frank Alt, Peter Nelson, Ron Askin, Harry Wadsworth and Greg Gruska, who has been region 10 councilor continuously since the inception of the Stat Division.

Ralph St. John

1998 FALL TECHNICAL CONFERENCE CORNING, NY. OCTOBER 22-23

One of the best values in applied statistics conferences is the Fall Technical Conference, jointly sponsored by the Statistics Division and the Chemical and Process Industries Division of the American Society for Quality, and the Section on Physical and Engineering Sciences of the American Statistical Association. For two days in October, researchers and practitioners meet to discuss the latest developments in statistical methods as they relate to quality improvement. The chemical and process industries and physical and engineering sciences are the application areas widely represented on this year's program.

The 1998 conference will be held October 22-23 at the Radisson Hotel in Corning, New York. One or more short courses will precede the conference on October 21. The program is still being finalized, but highlights include Pat Donnelly as the plenary speaker, Doug Montgomery as the Youden speaker, and a special invited session on chemometrics. As more program and registration information becomes available, it will be posted at <http://www.sas.com/ftc98/>.

Fall Technical Conference Student Scholarships

The Statistics Division of ASQ is offering 5 grants to cover the cost of registration, meals (up to \$50) and lodging for students to attend the Fall Technical Conference (FTC). The FTC is jointly sponsored by the Chemical and Process Industries Division and the Statistics Division of ASQ, and the Section on Physical and Engineering Sciences of the American Statistical Association. The 1998 FTC will be held Thursday and Friday, October 22 and 23 at the Radisson Hotel in Corning, NY.

Currently enrolled undergraduate and graduate students of statistics and quality management are eligible. Travel costs are not covered. Recipients may be asked to serve as room monitors for a conference session and must write a brief article about their conference experience for the Statistics Division Newsletter.

Please send a letter of interest, and a letter of recommendation from a major professor, by August 1, 1998, to:

Nancy E. Belunis
Merck & Co., Inc.
One Merck Drive
P.O. Box 100 WS1E-45
Whitehouse Station, NJ 08889

Notifications will be mailed by September 1.

CHINA - U.S. CONFERENCE ON QUALITY: Quality Strategies for the New Millennium

Global Interactions, Inc. and the China Association For Science and Technology (CAST) in conjunction with the American Society for Quality and the China Quality Control Association will convene the first CHINA-U.S. CONFERENCE ON QUALITY, November 3-6, 1998, in Beijing, PRC. The conference is designed for quality professionals in China and the U. S. to share best practices and research in order to develop and build relationships among professional and business partners.

The four days of the conference will include Opening Ceremonies in the Great Hall of the People, concurrent sessions, panels, and poster sessions for three days, and one day of site visits to industries, factories, and facilities to observe quality standards in operation. Participants may remain in Beijing for three additional days of sight-seeing. Pre and post Conference Programs will be arranged to enable persons to visit other cities in China.

Exhibition space will be available at the conference. Applications for booth space are available from Global Interactions, Inc.

CALL FOR PAPERS (DEADLINE 5/22/98)

The Steering Committee invites papers for this conference. Abstracts are not to exceed one page double-spaced, using 10 point type. Include presenter's name, title, company/organization, mailing address, phone, fax, and e-mail address. Paper must relate to one of these areas:

- * Quality Management and Leadership
- * Process Improvement Through Statistical Methods
- * Quality Systems, Standards and ISO 9000
- * Customer Service and Satisfaction
- * Strategic Planning: Process and Implementation

Send to: Global Interactions, Inc.
9002 N. Central Ave., Phoenix, AZ 85020
Phone: 602/906-8886 Fax: 602/906-8887
e-mail: global@goodnet.com

Papers will be reviewed and selections made by July 1, with response to submissions by July 10. The China Quality Control Association will match with papers from China on similar topics, and dual presentations will provide a perspective on differences and distinctions between U.S. and Chinese approaches to quality.

For full information check the website:
<http://www.goodnet.com/~global>

53rd Midwest Quality Conference Sep. 24-25, 1998 – Wichita, KS

The 1998 Midwest Quality Conference has the theme "Challenging the Millennium — Leaping into the Future". Presentations will follow the tracks: Quality Payoffs, Working Together, Developing People, and Technical Applications. Inquiries: Gary H. King, (316) 221-7999, E-mail: chuckles@jinx.sckans.edu

1998 Midwest Biopharmaceutical Statistics Workshop

The theme of the workshop is "Resampling Methods". The meeting will be held May 18-20, 1998 in Muncie, Indiana. For further information please contact Kim Perry ktperry@am.pnu.com or 616-327-8511.

GORDON RESEARCH CONFERENCE Statistics in Chemistry & Chemical Engineering

The Gordon Research Conference (June 28-July 3, 1998) fosters the exchange of new ideas among researchers/workers in statistics, chemistry and chemical engineering. Outstanding statisticians and chemometricians present work on methods of potential relevance for chemists and chemical engineers, while chemists and engineers present real-life problems and proposed solutions. Details are posted at the web site: <http://www.grc.uri.edu/progra~2/stats.htm>

54th DEMING CONFERENCE ON APPLIED STATISTICS

December 7-11, 1998, Atlantic City, NJ. The 54th Deming Conference on Applied Statistics will be held at Resorts in Atlantic City. Twelve seminars over the first three days will feature instructors from industry and academia. Two 2-day short courses will focus on statistical applications in the pharmaceutical industry and applied statistics in general. For information: Walter Young, Fax: (610) 989-4553; E-mail: youngw@war.wyeth.com. The conference is cosponsored by the ASA's Biopharmaceutical Section and ASQ's Statistics Division and Metropolitan Section. The conference was cofounded by Dr. W. Edwards Deming who participated annually. It has been devoted to teaching applied statistics in a tutorial format for the past two decades. Bert Gunter bert_gunter@merck.com is the new Statistics Division representative on the conference committee.

Statistics Division Speakers' List Information Form

The Statistics Division maintains a speakers list of individuals who are knowledgeable on statistics-related topics, and who have expressed a willingness to be invited to speak (at Section meetings, public forums, etc). The division will make this list available to interested parties. Individuals on the speakers list negotiate their own terms (expenses, speaker's fee, etc) for giving presentations. If you wish to be included on this list, please complete the form below and send it to J.L. Madrigal.

YES!! I would like to be included on Statistics Division's Speakers List

Name: _____ Date _____

Please provide the following information:

Address: _____

Phone Number: _____ FAX Number: _____ email address: _____

ASQ Section: _____ ASQ Region: _____

Statistics Division Member: Yes No Expense reimbursement needed: Yes No

Travel Range: Unlimited Limited to _____ mile radius

Please list topics on which you would be willing to speak:

Other Comments/Qualifications, etc

**Please return this form to: J. L. Madrigal
222 TMCB
Provo, UT 84602**

**Phone: (801) 378-7357
FAX: (801) 378-5722
E-mail: madrigal@byu.edu**

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Treasurer	Janice Shade	shadej@nabisco.com	(973) 682-6236

MINI PAPER

COMMENTS ON 'A TUTORIAL ON PROBABILISTIC RISK ASSESSMENT FOR NET PACKAGE CONTENTS'

By Charles R. Burke
[C.R. Burke@colint.com](mailto:C.R.Burke@colint.com)

In reading Dennis King's minipaper on Probabilistic Risk Assessment in the Fall 1997 ASQ Statistics Division Newsletter, two thoughts came to mind: first, the risk is heavily dependent on the standard deviation as well as the average fill weight setting; secondly, the capital cost to achieve lower standard deviation may be less than the material cost to 'overfill', on average, in order to avoid underweight penalties.

1. Control Importance

King shows the computation of Case II Risk (penalty if the weight of the lightest container in a sample of 10 falls below 99% of the Lower Fill Level) in the instance of a process with a fill accuracy standard deviation of .3 oz. No mention is made of the need to monitor the accuracy and compute the potential risk if control of the standard deviation is lost. What happens to risk of the process standard deviation also changes? Computations similar to King's yields the results in the table below.

Fill Level	Risk of Violation				
	Process Standard Deviation				
	.250	.275	.300	.325	.350
64.01	.0456	.0868	.1414	.2056	.2750
64.05	.0285	.0590	.1022	.1565	.2184
64.10	.0153	.0350	.0661	.1083	.1597
64.15	.0079	.0202	.0415	.0728	.1137
64.20	.0039	.0112	.0252	.0477	.0790
64.25	.0018	.0060	.0149	.0304	.0536

Thus the risk can change quickly and dramatically with a small change in control of the standard deviation. If the standard deviation changes from .3 oz at the 64.15 oz fill level by as much as 0.05 ounce the risk can be lowered to less than 1% or can increase to more than 11 percent.

2. Capital Investment

Using the same numbers, the capital investment computation could be illustrated: Facts assumed: 1,000,000 packages per year and product cost \$1.60. If the 95% 'comfort level' is elected at the .3oz standard deviation the annual cost of quality between it and the .250 standard deviation is approximately .13 oz (ie a 5% risk requires a setting of 64.13 when the standard deviation is 0.30, but a setting of 64.00 yields a 5% risk when the standard deviation is 0.25) of product per package for an annual cost of .13 ounce * 1,000,000 packages * 1.60 per pound / 16 ounces per pound, or \$13,000 per year. Thus if the standard deviation can be reduced to 0.25, a material or content savings of \$13,000 per year can be realized.

This amount can then be utilized to compare to the capital required to improve the fill standard deviation. If the capital cost is less than \$13,000 per year, then invest in the 'equipment' which can reduce the standard deviation from 0.3 to 0.250.

References:

King, Dennis W., (1997), 'A Tutorial on Probabilistic Risk Assessment for Net Package Contents', ASQ Statistics Division Newsletter, Vol. 16, No. 7.



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Bowling Green, OH 43403-0267

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The ASQ Statistics Division Newsletter is published quarterly by the Statistics Division of the American Society for Quality.

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This will change the address for all publications you receive from ASQ including the newsletter. You can also handle this by phone (414) 272-8575 or (800) 248-1946.



UPCOMING NEWSLETTER DEADLINES

Issue	Vol.	No.	Due Date
Summer '98	17	3	June 15, 1998
Winter '99	18	1	Nov. 15, 1998



Printed on Recycled Paper