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CONTENIDO

Pág

Notas de la Dirección 1

Operator Errors - Time for a New Look 1

Conferencia 3

Simulación

Ulises Fuentes, Carlos Martínez

ITT Cannon.

Notas de la Dirección

Conferencia Mensual

El mes pasado, se llevó a cabo la conferencia de enero en la empresa Grupo Chamberlain. En esta ocasión, Tim Brown de Smithers Quality assessments, Inc. nos ofreció una rápida revisión del estándar ISO 9001:2000.

Tim mostró los aspectos más importantes de los requisitos de ISO 9001 enfatizando el enfoque de procesos del sistema de gestión de calidad (SGC). Al identificarse los procesos más relevantes que se necesitan para realizar el producto -incluyendo aquellos de soporte así como sus interacciones, el SGC queda mejor definido.

Cada proceso tiene sus propias entradas, salidas y controles y recursos. El enfoque de procesos exige identificar estos elementos, controlar y darle seguimiento a los resultados y buscar la mejora continua de los mismos. Los auditores buscarán evidencias en estos procesos para determinar el cumplimiento con los requisitos de ISO 9000.

Agradecemos a Tim Brown por su gentileza y disposición para ofrecernos esta conferencia, así como a los asistentes a la misma. También le damos las gracias al Grupo Chamberlain por el apoyo que ha demostrado a las actividades de la ASQ.

Curso de Ingeniero de Calidad

El próximo 10 de marzo empezamos un nuevo curso de Ingeniero de Calidad, pueden verse los detalles en la página www,asnogales.org.

Nos vemos en la siguiente conferencia.

Victor Reyes – Publicidad/Publicaciones

Operator Errors - Time for a New Look

By Joseph M. Juran

En el boletín del pasado mes de septiembre 2003 se publicó un resumen-traducción libre del este artículo de Juran, en esta ocasión el artículo estará en inglés por dos razones: a) las traducciones siempre implican la limitación de visión e interpretación del traductor b) el tema sigue siendo vigente aún cuando el artículo fue publicado en enero y febrero de 1968! [VR]

There are good grounds for asserting that our managerial convictions about "operator error" are derived mainly from unsupported beliefs which, over the years, have acquired an aura of mystery, superstition and dogma. It further appears that these beliefs have become deeply rooted in the managerial culture to a point that they are stubbornly resistant to challenge, whether by competitive theory or by contradictory facts.

My grounds for these assertions are broader than just one man's experience. In recent years, in my courses on Management of Quality Control, I have been taking soundings from the attending managers through assignment of group projects for discussion and solution. Some of these projects deal with the subject of operator error. Tallying up the results of the polls, discussions and conclusions of these and related soundings taken in these courses, it is my conviction that despite all the programs, posters, pledge cards, pep talks and the rest, many companies have been fighting a war without knowing clearly who is the enemy. This is no way to fight a war.

What is lacking is clear, quantitative knowledge about the nature of errors. Only through such knowledge can the superstition and dogma be challenged successfully. However, since we lack this knowledge, there persists a widespread confusion about the nature and extent of operator errors. Amid such confusion, it should not be surprising if managers appear to grasp at straws, at panaceas, at the lure of the demagogue. To many of these managers, such programs are squarely in line with their axiomatic beliefs, and hence, completely logical.

t is high time for our theoreticians and practitioners to wade into this subject, to think it through, and to put together the factual data needed to identify and quantify the elements which make up what we so glibly call "operator error." What follows here is one man's contribution.

Concept Of Self Control

One most useful step we could take is to talk about first things first. There has been too much talk about operator motivation as if it were the starting point in dealing with errors. In modern industry the starting point is not operator motivation, but rather the concept of self control. Under this concept, we set up a job so as to make the job holder self-sufficient. We provide him with the means needed to carry out his assigned job, and we then hold him responsible for getting results. We have been rather clear about insisting that the job holder produce results, but we have been less than clear about defining the "means needed" to carry out the job, i.e., the criteria for self control. These consist of the following essentials:

1. Means for knowing what he is supposed to do.

Continúa en la página 4

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CCT Calibration Technician **CQA** Quality Auditor **CQE** Quality Engineer **CQIA** Quality Improvement Associate **CQPA** Quality Process Analyst **CSQE** Software Quality Engineer **SSGB** Six Sigma Green Belt	• Abr 6 • Oct 5	• Jun 2 • Dic 1
CBA Biomedical Auditor **CHA HACCP** Quality Auditor **CMQOE** Manager of Quality/Organizational Excellence **CMI** Mechanical Inspector **CQT** Quality Technician **CRE** Reliability Engineer **SSBB** Six Sigma Black Belt	• Ene 19 • Ago 17	• Mar 3 • Oct 20

ASQ AMERICAN SOCIETY FOR QUALITY™

SECCIÓN 714 AMBOS NOGALES

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Basado sobre el conjunto de conocimientos del CQE, *Certified Quality Engineer* de la ASQ

Fecha: 10 Marzo – 26 Mayo, 2007 | Lugar: Hotel Plaza Nogales
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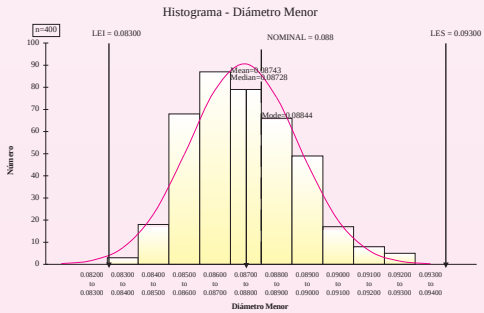

Costo: $8 250 pesos + IVA

Descuentos: 10% organizaciones que envíen 3 ó más participantes ó 10% a participantes que tengan membresía vigente de ASQ*
Mayor información: Ing. Victor Reyes (victorreyes@prodigy.net.mx) ó Ing. Gabriel López (glopez@westmedinc.com)
El contenido del curso lo puede encontrar en www.asqnogales.org
*No aplican ambos descuentos combinados, es uno u otro.

SIMULACIÓN

Conferencistas

ULISES FUENTES Y CARLOS MARTÍNEZ

ITT CANNON.

Febrero 28, 2007
18:00 hrs.
Lugar: ITT Cannon

Prolongación Ave. Obregón 3673
Parque Industrial (contraesquina con CR Bard)
Nogales, Sonora, México

Entrada Libre

Conferencistas

Ulises Fuentes
Ingeniero Mecánico Industrial del Instituto Tecnológico de Querétaro. Ulises cuenta con amplia experiencia en manufactura e ingeniería ocupando posiciones de supervisión y gerencia en empresas como General Electric, Memex, Verbatim, Jerrold, Acco e ITT.
Ha participado en la implantación de ISO 9000 desde 1986 en Verbatim. También ha participado en 12 transferencias de producto desde lugares como Taiwán, USA y Reino Unido a Nogales. Actualmente coordina la construcción del nuevo edificio para ITT Nogales.

Carlos Martínez
Ingeniero Industrial y de Manufactura del Instituto Tecnológico de Nogales con maestría en Administración de Negocios y certificaciones de Lean Master y Green Belt. Carlos se ha desarrollado profesionalmente en ITT Cannon Industries en diferentes puestos de ingeniería de manufactura y calidad. ha participado en transferencias de nuevos producto y en la implementación de Kankan y flujo continuo. Actualmente es líder del proyecto de automatización de Alemania a Nogales y trabaja en reducción de costos.

2. Means for knowing whether he is doing what he is supposed to do.
3. Means for changing what he is doing if it does not conform with what he is supposed to do.

If we have failed to provide any of these essentials, the resulting errors should be classed as management controllable. If we have provided every one of these essentials, the resulting errors should be classed as operator-controllable, and it then becomes timely to talk about motivation.

It is most important that we understand clearly, in any specific situation, whether we are dealing with management-controllable or operator-controllable errors. These two species differ remarkably as to methods of diagnosis and especially, as to methods for remedy. The one spices requires that we look mainly to the designs, processes, methods, instruments and other features of the "situation," using the tools of science, engineering and management. The other spices requires that we look mainly to the operator, using the tools of the behavioral sciences.

In the majority of companies there has been little study to determine what proportion of errors is operator-controllable and what proportion is management-controllable. Such is the feedback from my courses. However, enough of such studies have been conducted to tell us a great deal about these proportions. By and large, about 20% of all errors are operator-controllable, though this varies greatly among companies, and especially, from process to process. Accordingly, each company should know its own situation, in toto, and as to the important subdivisions. Lacking this knowledge, the grand strategy of error reduction is blind - the managers don't really know what they are fighting.

Managerial Theory Of Operator Error

The feedback from the courses on Management of Quality Control has been rather illuminating in discovering managers' beliefs about operator error. The polls (originally by a show of hands and more recently by secret ballot) have been in response to two questions relating to man-agers' beliefs about worker motivation:

1. On a by-and-large basis, do your fellow managers back at home subscribe to the indifference theory* of industrial behavior (i.e., workers exhibit no enthusiasm for good work because people are no damn good) or do they subscribe to the craftsmanship theory* (i.e., workers exhibit no enthusiasm because the managers haven't designed industrial jobs in a way which makes them very interesting). In 12 such polls conducted during courses held in the United States (1964-1967), out of 522 attending managers polled,

   209, or 40% felt that the managers back home adhere to the indifference theory, and

   313, or 60% felt that the managers back home adhere to the craftsmanship theory.

   (The polls taken in the courses I have conducted abroad reveal some very interesting differences in managerial attitude internationally, but that is another story.)
2. If you (the managers attending the courses) were given charge of a brand new plant, would you run it under the indifference theory or the craftsmanship theory?

   Out of 129 attendees polled:

   121, or 94% would choose to operate under the craftsmanship theory;

   8, or 6% would choose to operate under the indifference theory.

As to this question, there seem to be no differences internationally. In no country has such a poll shown less than 80% of the attendees favoring the craftsmanship theory. From these polls it is my conclusion that:

1. Company management's differ widely in their beliefs as to what causes industrial behavior adverse to company interests.
2. To an astonishing degree, managers attending the courses do not concur with these beliefs as presently held by their company management's.

Under such a state of affairs, it seems evident (to me) that an essential prerequisite of a motivational program is an understanding of (a) what is the prevailing company attitude toward worker motivation, and (b) to what extent is this attitude really supported by the managers. This is important, since the managers do not merely theorize. They act on the theories. The decisions on whether to trust operators or not, whether to use many or few inspectors, whether to rely on system vs. people, are all related to what are the managers' beliefs about motivation. The character of the motivational program is likewise affected by these beliefs.

Subspecies Of Operator Error

Beyond the need for understanding the state of managerial theory about operator motivation, there is a need to look deeper than ever before into the nature of operator error itself. Right now there exists a widespread belief among managers that once we have met the criteria for operator self-control, the manager's job is done, and the rest is up to the operator. In terms of organization theory, this belief is well-founded. However, in terms of getting results, the belief is a gross over-simplification, since it ignores the wide differences in the kinds of operator error.

Some years ago this editor undertook to categorize the subspecies of inspector error. It turned out that these subspecies were so different from one another that knowledge of these differences was an essential prerequisite to reduction of inspector error**.

In the light of this experience, and with the clear need for a deeper understanding of the nature of operator error, it is timely to propose that we classify operator error into its subspecies. There are at least three of these:

a. Willful errors. The operator is deliberately failing to comply. He could comply, but he has no intention of doing so, for reasons which are good enough for him.
b. Lack of skill. The operator is unintentionally failing to comply. He is aware of the errors as he makes them, but he is unable to eliminate the errors - he isn't skillful enough.
c. Inadvertence. Not only is the error unintentional; the operator is even unaware he has made the error.

We have very little data on what is the industry-wide breakdown of operator errors among these subspecies. (This editor would welcome such data.) Since, as we shall see shortly, each of these subspecies has its own problems of diagnosis and remedy, the lack of this breakdown is again a handicap to grand strategy. Lacking data on the breakdown of operator errors by these subspecies, it is all too easy for managers to conclude that the errors are all willful, and all too many managers actually believe this.

Willful Errors

Willful errors result from a wide variety of personal reasons: a short cut to make it easier to meet some other standard (cost, schedule, etc.); a belief that the quality standard is nonsense; a way of getting even with the boss; and so on. Some, perhaps most, of the reasons are the result of "good" intentions rather than malice. However, the logic behind all of these reasons is based on the premises of the operator. The manager who tries to understand these willful errors by logical reasoning from his own premises ends up in a state of frustration or in a state of unwavering belief in the

Continúa en la página 5

"X" (indifference) theory of operator motivation.

The missing ingredient is the understanding of what is on the worker's mind when he makes and continues to make willful errors. Seldom can this understanding be arrived at solely by discussion among managers. They are trapped by their own premises within their own self-sealing thought system, including the fact that they (the managers) are also a part of the problem. To get objective answers the managers would need to sample employee thinking. In turn, since most managers are but amateur psychologists, such a study would require that they enlist the aid of the personnel specialists and behavior scientists. To bring these people into the act has complications of another sort. Such a project is difficult to organize and it carries the risk that at the end of it the manager will get answers not in the form of meaningful data, but in the form of the gibberish of the world of psychology.

Lack of Skill

In studying processes which are highly operator-controllable, it is common to find that some operators make less errors than others. This is a consistent phenomenon - it goes on month after month.

What causes this consistent difference? There is a wide variety of theories: the better operators come from an ancestry with a tradition of good work; they are naturally better motivated; they have a knack; they have a natural aptitude (how do you explain Bill Tilden?); and so on.

This editor takes a dim view of these armchair explanations. In my experience, when there is a consistent difference in operator performance, the place to discover the reason for the difference is the factory floor, not the office. The technique is to study, in detail the operations as performed by both the "good" operators and the "bad" operators. Most of the time these studies are rewarding; they disclose what it is that the one does which the other does not. In this way the "secret" is made known to the managers who then possess the key for bringing all operators up to the level of the best.

The foregoing technique is not limited to quality improvement; it has universal application in other industrial functions and outside of industry as well. In its generalized form, the technique consists of:

1. Measuring the performance of multiple performers to discover who are consistently the best and who are consistently the worst.
2. Observation of the actual practice of the performers, both best and worst, to discover the differences in their practice.
3. Experimental verification to identify which of these differences of practice bring about the differences in results.
4. Extension of the best practices to all performers through retraining. redesign of the process, or other appropriate means.

The main significance of such studies lies in the fact that a solution is already in the house, i.e., the "best" operators are in fact solving the problem somehow. However, the nature of this "somehow" is not known to the management or to the "worst" operators. (I have seen plenty of instances where it wasn't known to the "best" operators either) The problem in lack of skill is more usually one of finding this secret solution than one of inventing a new solution.

The successful end of such studies is to bring everyone up to the level of the best, to make a champion out of every duffer.

Inadvertent Errors

The distinguishing feature of this subspecies is that at the time of the error the operator is not even aware of its existence until it is called to his attention, either by someone else or by some evident consequence of the error. Such errors are inherent in the fallible nature of the human animal (or at least such is the experience and hence the belief of some of us).

Recently we have seen an attempt to solve this problem by denying its existence, i.e., by asserting that human fallibility doesn't exist once the right motivational lever is thrown. In due course the experimental evidence will have the last word as to this new theory. Meanwhile, the record is of another sort: Historically, human beings have been fallible, including the champions; historically also, we have reduced inadvertent errors not by motivation but by fool proofing operations. Our factories exhibit masterpieces of error-free processes. The managers properly take pride in them and exhibit them as works of art, which indeed they are.

Operator controllable errors

Activity	Manag. Controllable errors	Willful	Lack of skill	Inadvertent
Observed errors	X	XX	X	–
Theorizes as to causes of errors	X	XX	X	–
Analyze to discover true causes	X	XX	X	–
Theorizes as to remedies for causes	X	XX	X	–
Analyze to discover optimum remedy	–	XX	–	–
Apply chosen remedy	–	XX	X	–

Legend:

xx operator's possible role is significant, even decisive
x operator's possible role can be useful
\- operator's possible role is dubious

The concept of fool-proofing is not limited to solution of inadvertent errors; it can deal with any subspecies of error, whether due to lack of skill, to willfulness, or still other causes.

Role Of The Operator

Elimination of errors, whether operator-controllable or management-controllable, requires that we go through an invariable sequence of activities:

1. Observe errors by their symptoms.
2. Theorize as to causes of symptoms.
3. Analyze to discover the true causes.
4. Theorize as to remedies for these causes.
5. Analyze to discover the optimum remedy.
6. Apply the chosen remedy.

Continúa en la página 6

The table depicts the usual extent to which the operator can play a useful role in the foregoing sequence.

I have structured the table (published here for the first time) to reflect conditions as commonly found in American practice. Obviously, the table would differ depending on conditions in different plants. In a radically different culture such as the Japanese QC Circles* the table would be remarkably different, since the operators are trained in use of the tools of analysis, and are motivated to take on projects of discovering causes and remedies for all types of errors.

Table I offers a do-it-yourself matrix for any company. (If the table doesn't reflect the conditions in your company, tailor the table to fit.) The point is that it is feasible for any company to judge the useful role of the operator as to the various permutations of subspecies of error and of activities needed to convert symptoms into remedies.

It is significant that the operator can make a useful contribution not only as to operator-controllable errors, but also as to management controllable errors. However, in the case of the latter species, his contribution is concerned with identifying the shortcomings in the system of self control. The operator is commonly in a good position to discover these shortcomings, since he meets them at every turn: information incomplete; machines in need of maintenance; instruments out of calibration.

Not only is the operator often aware of these shortcomings; he often brings the matter to the attention of the supervision. Sometimes this is done by the operator taking the initiative in response to suggestion schemes and the like. More usually the operator does it defensively, to avoid being blamed for something beyond his control.

Some of the worst quality morale situations are found in plants where these findings of the operators are not acted on by the supervisors. These inaction's tell the operators that the management has no interest in quality, no matter what the posters say. In fact, one of the very real benefits of the motivational campaigns is that the supervision is now forced to take action on these same shortcomings in the system of self control.

Conclusion

The foregoing is necessarily a limited analysis. Some of the assertions are backed up by ample data; mostly they are not. But they are assertions which can be tested by any practitioner who has a living laboratory in which to conduct a do-it yourself study.

The main burden of this paper is to urge practicing managers to dig out the facts as to:

- the state of self control
- the proportions of management controllable vs. operator-controllable errors
- the proportions of the various subspecies of operator errors.

Any one conducting such a study not only stands to clarify the factual situation in his own company; he stands to make a contribution to his fellow practitioners as well. His factual data will certainly be studied with interest. But more than this, our experience is that when new data are collected, fresh challenges can be put to long-standing beliefs. We can make good use of a few such challenges. CPI

*See Juran, J.M., QUALITY CONTROL HANDBOOK, Second Edition, pages l0-15 to 17. McGraw-Hill Book Co, 1982.

** For elaboration see Juran, J. M., QUALITY CONTROL HANDBOOK, 2nd Edition, pages 8-25.to 8-35. McGraw-Hill Book Co, New York.

o Juran, J. M., the QC Circle Phenomenon. Industrial Quality Control, January 1967, pages 329-336.

Dr. J. M. JURAN, Author of eight books and numerous papers on various management subjects, Dr. Juran maintains an active schedule as management consultant, international lecturer, and corporate director. He is a contributing editor to Quality Progress and has been a member of ASQC since 1946.

NOTA - Este artículo estuvo disponible en el Instituto Juran, www.juran.com, y también lo publicó en el internet el Círculo de Profesionales de Ingeniería Industrial (CPI) - de Puerto Rico [VR].