DISCUS

Accelerating Manufacturing & Quality Engineering

Quality Inspection Nightmares

The Top 5 Quality Inspection Nightmares and
What You Can Do About Them

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Introduction

Quality is free. It's not a gift, but it's free. What costs money are the unquality things—all the actions that involve not doing jobs right the first time.

--Philip Crosby

The nightmares shared below and the associated prescriptive solutions come from our many years of experience working with quality engineers in manufacturing organizations. Pursuing software solutions to these and other challenges is our purpose as an organization. We hope that you gain at least one idea or tip on how to address your challenges. If not, contact us and challenge us directly with your problem.

Here are the 5 Nightmares addressed in the rest of this document:

Nightmare #1: Each Customer has a Unique AS9102 Form

Nightmare #2: FAI Reports are Time Consuming

Nightmare #3: Scrap and Rejects are Reducing Profitability

Nightmare #4: Unprepared for Emerging 3D Model Requirements

Nightmare #5: Failure to Define Standardized inspection Criteria

Nightmare #1: Each Customer has a Unique AS9102 Form

One customer wants you to enter inspection data directly into their web-based screens; a second customer requires the actuals to be entered in their specific Excel format; meanwhile the third customer insists you to load the characteristic requirements into their proprietary online system.

As a result, you have specific employees dedicated to setting-up and completing the FAI report for each customer, thus draining your own resources. Each employee has to be the "customer expert" just because the format and media is so customer specific.

Responding to this challenge, an aerospace quality manager complained, "We had customer demands driving how we conduct our internal business processes and it was killing us. We were so busy filling out specific, customized AS9102 forms we were spending weeks on end doing repetitive paperwork instead of shipping parts."

Adding new customers just creates more unique AS9102 demands, thus stretching your limited resources even further. Often the prospect of adding yet another customer, and their unique AS9102 forms, further stresses your overwhelmed quality department. If this sounds all too familiar, here are three solutions to this problem.

A single tool for all customers

You need one, easy approach to meet your varying customer demands. A simple approach using a single AS9102 characteristic identification tool will let you identify the characteristics and model data for all of your customers in one complete approach.

Eliminate redundancies

By using tools that allow one common process for multiple customers, eliminate repetitive processes and documentation. This solution will allow you to reallocate valuable resources. As a matter of fact, with a single software tool, you will need fewer employees dedicated to customer-centric quality inspection forms and eliminate the need for customer experts. By maximizing tools that provide the customized format and focus for a specific customer, you can easily select the customer's output preference, excel, website etc., and automatically respond to the unique demands of that customer. You can address customer's preferences in a matter of hours, not days.

Control your processes

By using this single approach, then reassign personnel to do what they do best, inspect and ship the parts, not manage redundant paperwork. In short, start driving and redirecting your business processes instead of having your customer's specific AS9102 needs determine your resources and planning.

Nightmare #2: FAI Reports are Time Consuming

If you regard your FAI documentation as just another report imposed on you without any internal benefit, you may be missing some quality inspection opportunities. Many suppliers spend hours and days, just entering tons of data without realizing any real benefit for their own quality needs. For many companies, the FAI is just a costly burden that is necessary to meet customer demands and nothing more.

Successful Aerospace Suppliers

The most successful aerospace suppliers recognize the value of "on-going" characteristic accountability and verification and use this information, required by AS9102 reporting, for internal quality improvements. For example, a small aerospace supplier in Cincinnati, Ohio

now develops the list of characteristic requirements early in the part production lifecycle. In addition, this company uses the same tool for ballooned characteristics for in-process quality and SPC data. This tool enables this company, already overwhelmed with orders, to be pro-active, rather than reactive. The quality manager noted, "With this approach, Manufacturing now doesn't have to wait for Quality to do the paperwork; it's done within hours of receiving a completed process from Engineering. We make the FAI process work for us."

Time Consumption Unacceptable

A supplier in Hartford, Connecticut struggled with the time it took to assemble the complete technical data package for a part. The Quality Manager commented, "We want to make sure that we don't miss any critical requirements so we try to organize all of the technical documents that define the part." When a new part shows up, they used to examine the drawing and try to identify all the pertinent specifications. They would then look-up the specs and either print them from PDF files or pull the documents out of the filing cabinets. This was a time-consuming process that took hours to complete. Meanwhile, this supplier has many orders for fabricated parts that involve over 300 characteristics for each part. It would take their quality personnel days just to identify the characteristics and setup the database of requirements.

Minutes Not Hours

This proactive supplier adopted a software tool that enables them to electronically organize the technical data package and automatically identify the part characteristics. This company now creates the technical data package and sets up an FAI and SPC in a matter of minutes. The data, from the Bill of Materials, to specifications to purchase orders, can be accessed in this tool and later archived. When customers visit, the supplier can access all the documents from one tool and not forage file cabinets. Organized and complete, the

documentation accessed from one software tool, streamlines the audits and builds confidence in the supplier's processes.

Nightmare #3: Scrap and Rejects are Reducing Profitability

Many factors may play into your scrap nightmare: wrong or misread tolerances, incorrect materials, and in precise measurements. These nonconformance nightmares will cost you plenty. It's the call from your customer, or the news from the shop floor no one wants to get: "The part doesn't fit." The amount of time and effort for a redo is a tremendous drain and distraction.

A customer reject can cause unprecedented havoc, embarrassment, and serious delays. Plus the customer's confidence in your processes may be questioned and can impact future business opportunities (via negative word of mouth impacting referrals), tarnish your repetition in the industry and impact repeat work from existing customers.

Scrap Touches Everything

Scrap touches all facets of design and manufacturing, so the effort to reduce scrap and rework must be as a company—wide effort. For a small or medium-size enterprise (SME), this may seem too costly and ambitious, but the alternative, doing nothing, is more expensive and time consuming. Here are some solutions that some companies are employing to reduce scrap and avoid rejections.

With the computer-based characteristic identification tool, it's easy to establish the requirements during the early stages of the production lifecycle. The leading aerospace suppliers organize and prioritize the requirements to electronically determine RFQ advantages and PO responses. In fact, a characteristic tool can show you if you missed any requirements, highlight specification innuendos and, overall, perform characteristic identification when you receive the RFQ or PO to help clarify customer requirements.

Capture the requirements up front in the process

A supplier located in the Phoenix area, now captures requirements for up-front quoting, so they can fully understand their customer's requirements, and then they reuse the data -- when they win the job -- for the FAI. They have significantly reduced FAI preparation time, and are happy to report that their scrap was dramatically reduced as well as returns. This process improvement literally saves them millions of dollars.

Use the customers' forms for internal analysis

Another supplier in New York analyzes all of this data in his customer's specific format, such as listing the upper and lower spec values. A software characteristic tool dramatically shows actuals that are close to out of tolerance, those which are key, and those that are out of tolerance.

Be proactive with upfront data analysis

For one supplier, dimensional variation was an ongoing problem. For example, he found that the drill bits were sharper in the morning, than later in the day. An open door caused temperature fluctuations that triggered shrinking or expansion. With a characteristic and measurement capturing tool, one that collects the discreet measurement data, he could identify the result value that was straying from the ideal tolerance and immediately check the tool and environment to correct the issue. This was performed before the part became a candidate for scrap or rejection, making adjustments earlier in the process. He found that being pro-active, earlier in the process, saved his company much time and improved their upfront processes.

Nightmare #4: Unprepared for Emerging 3D Model Requirements

Today aerospace suppliers must deal with a mix of technical data formats required by their customers. For example, some aerospace prime contractors are only sharing dimensionless 3D CAD models with their

suppliers for their new programs. Others only provide drawings as PDF or Tiff files. Adding another wrinkle to this media mix, 3D data types are numerous and varied, and the modeling software is expensive for each model type. To be competitive, companies must have the flexibility and a single software tool to deal with these varied formats and customer demands.

As customers share their dimensioned and non-dimensioned data as a model, many companies struggle with purchasing the pricy and appropriate CAD software to open these models; nevertheless, they need a means to extract the model information to do work for this customer. While having this business and customer should lead to profitability, the means to respond to this customer's demands can overwhelm a supplier's resources.

### Software Characteristic Identification Tool

Finding a software characteristic identification tool that is affordable and extracts the data from all model types has been a solution that has saved companies thousands of dollars. By having the CAD modeling format imbedded into the tool, saves companies the expense of another seat of Catia, for example. Software that can interpret the modeling data and provide auto-ballooning has been a dramatic solution for these companies. They have one tool that meets the multiple CAD modeling challenges.

Yet relying exclusively on 3D models for characteristic identification is not a panacea for all their quality challenges. Many small to large enterprises believe that the CAD modeling world will solve all their design and documentation woes and give them all they need for the AS9102 compliance. Once the model is released to them with the product manufacturing information imbedded in that model, they believe they can simply "go with it" and be done. Nothing could be further than the truth. The modeling information may only hold a portion of the requirements needed for a completed set of documentation. CAD software must be able to access other data from that model, its entity information, for example, that was not originally included, such as surface finish, which is rarely identified on the model.

Missed information results in scrap and rework

In fact, most CAD software does not provide the granularity for specification call outs or Bill of Materials (BOM). Both of these sources can be lost in the 3D world and without them, the critical part-making information is only partially captured. This missed information will result in scrap and rework.

Consider how the BOM comprises a significant portion of the part creation, such as part ordering and materials; this data must not be overlooked. Incorrect or missing BOM information can result in ordering the wrong materials, for example, and if the parts can't be reworked or returned, they become warehoused in the scrap heap. Missing the BOM is, by far, a most costly consequence of relying on 3D data alone. Extracting data in a combined approach for 3D and the BOM as expressed in 2D documents, is the solution to this very real challenge.
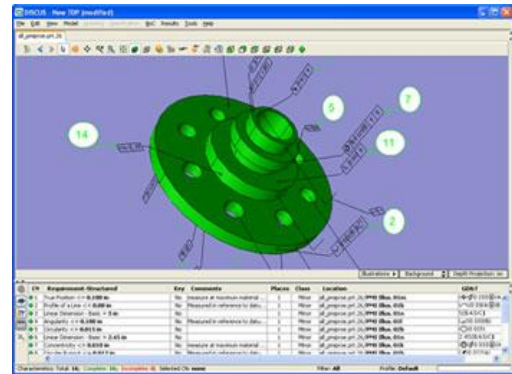
One software tool that handles the complexity of 3D modeling environment and the requirements of specifications and BOM is the best complete solution. A supplier in San Diego commented, "The ability to seamlessly select 3D for the modeling data then in a click add other data not on the model, but needed for part creation has been a god send. Then we access, in the same streamlined software, the 2D data for all the BOM and specification information. This approach leverages the dynamics of the 3D environment with the completeness of a 2D document."

One Aerospace Companies Approach

A company in Tulsa, Oklahoma, has taken the lead at using a common, consistent approach for older legacy parts and new parts that require CAD models. No matter the media — paper, raster images, and 3D models — this aerospace company now uses the same tool for various file formats from their customers. Instead of having to purchase the

various seats of 3D modeling software used by the various customers, they have one single tool, no matter the model type, that can open and interpret the data.

Clicks to Complete, Not Days and Weeks

What used to take days and weeks to identify the characteristic data, by converting the model into PDF format and then ballooning/identifying the characteristics, this company is now saving time, by using model data and uncovering the characteristic data in a matter of a few clicks. They extract the specifications and BOM in the same tool as a PDF format. They are taking advantage of all the data mixes for a complete FAI, thus meeting all the customer requirements.

By anticipating the emerging customer requirement for 3D models and the ability to switch, in the same technical data package, to a 2D document, this supplier has all the tools in place to provide the comprehensive documentation and the bandwidth to absorb more work and court new customers.

Nightmare #5: Failure to Define Standardized Inspection Criteria.

Suppliers in the aerospace industry rely heavily on their operators to interpret the internal processes for part creation, but often times these operators are provided a set of work instructions without a control plan. Without a control plan, the operator does not have the complete picture for managing and inspecting the discrete characteristics of the part. These results in an inconsistency of planning and can create problems in the part production. As a result, scrap is created, which is costly and downright wasteful.

In order to overcome this problem, the operator at the work center must be provided with both work instructions with the associated control plan.. The control plan can provide the visibility to the discreet elements of creating and managing the characteristics, by operations and provide the inspection method and frequency of testing thus providing a comprehensive data package. By using a single software tool, inspection criteria is defined,

and the control plan and work instructions are combined into a shop document, that is easy to read and accessibly. Such an approach provides savings, while providing a consistent control plan document thus improving productivity and reducing errors and time to market. Software that provides process control plans coupled with a set of work instructions and analysis streamlines processes and shows high-risk process failures before they occur. In this way, the quality engineer can take pro-active steps to guaranteeing part integrity. The work instructions and control plan guide the processes and are communicated in one document from one tool so everyone who touches the part is aware of the risks and can manage them appropriately.

A comprehensive planning tool

One company in El Cajon, California, overcame their significant part delivery delay caused due to inspection miscommunication. By employing a comprehensive planning tool, the supervisor was able to allow his operators to manage the processes and work instructions without his micro management. The software tool provided the salient information needed for the operator to inspect the part without intervention. This was a key feature of the planning software that provided the work instructions with the control plan at the respective work center.

Previously, the lone supervisor for the shop had to inspect the products manufactured at all the work centers and was running himself into inspection frenzy. Production often was halted until he had a chance to intervene for on the spot inspections and this resulted in tremendous delays and late-to-market issues. With the planning software tool, the operator is in charge of the inspection as he has the complete data to perform the inspections and does not have to rely on tribal knowledge of the supervisor. By empowering the operators, throughput was greatly increased, less scrap was created and the operator had ownership of the processes he manages.

Now a list of tools, gages and inspection methods and frequency is provided to each work station in addition to the dimensional information affected by the tooling. The planning

software tool has become the method of communicating and instructing the operators and scrap and rework were dramatically reduced. Overall, this software tool had the following impact:

- Engages operators to their full potential.
- Provides immediate availability of Control Plan as well as Special Instructions which prevents delays.
- Improved employee performance, instead of operators foraging for work instructions and control plans.
- Frees up the supervisor for other managerial tasks and reduces idle time of the operators.

In the first week of the software deployment, this supplier was able to highlight a characteristic change from the final inspection to its operation. The length of the component was reduced from .3109 inches in the in process drawing to .3028 inches in the final inspection. The software via a characteristic analysis showed them this delta value between the final and the in-process operation. Plus the step-by-step procedures with illustrations and gaging at every operation gave them information that had otherwise been hidden from the operator and was the responsibility of the lone supervisor managing many work centers.

About DISCUS Software

The DISCUS Software Company, founded in 2006 in Columbus, Ohio

The DISCUS Software Company specializes in the development of software tools for accelerating manufacturing and quality engineering. The DISCUS software tools are productivity solutions that dramatically reduce the time it takes to complete first article inspection, in-process inspection planning, process planning, and producibility analysis. DISCUS is compatible with many of the requirements used by companies such as Boeing, Ford, GE, Lockheed, and Siemens.

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