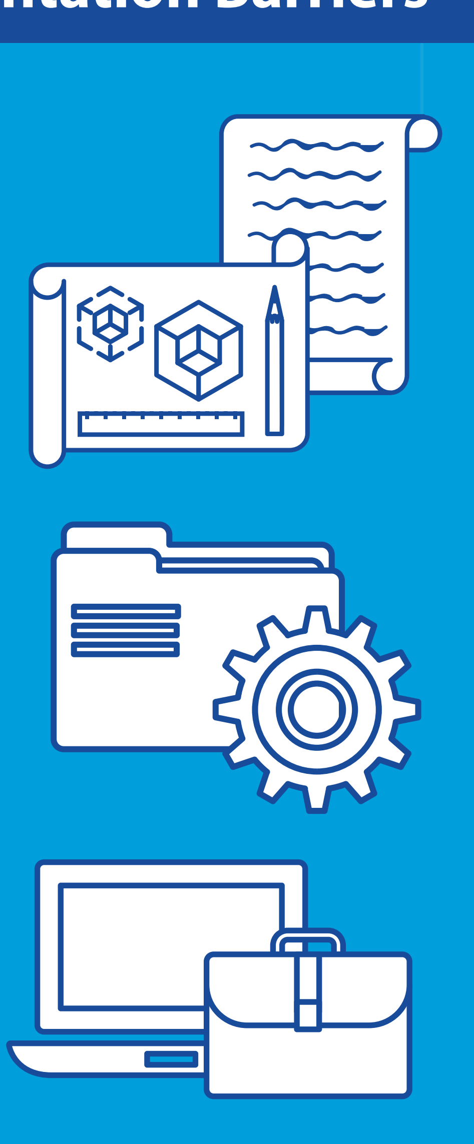
Accelerating Manufacturing & Quality Engineering

5 KEY INSIGHTS into APQP Implementation Barriers

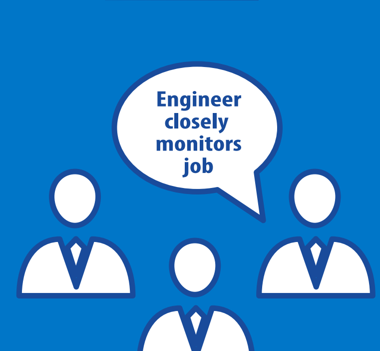


Many industries are beginning to adopt the formal methodology of **Advanced Product Quality Planning (APQP)** along with its rigorous **Production Part Approval Process (PPAP).** This adoption is primarily being driven from the top-down, whereby the **Original Equipment Manufacturers (OEMs)** are including in their purchase orders a requirement to submit typical PPAP documents prior to shipment. These documents, which act as proof of having performed APQP, encompass many manufacturing-related details. This includes process flow diagrams, process failure mode & effects analyses, and process control plans.

In general, these APQP-related initiatives have encountered a fair amount of resistance -- both internal (sourcing/purchasing department) and external (suppliers). This is primarily due to the perspective that PPAP efforts require additional work that do not add a commensurate value to the supply chain. In fact, these added requirements often increase the lead time of the parts as well as the supplier cost. It is this perceived lack of value that is the primary driver of the inherent resistance to the adoption of APQP.

To find a solution, it's useful to review the practical realities in industry that are behind this resistance. The sections that follow provide more detail on five insights gleaned from a survey of over 50 manufacturing companies based in North America.

1 Very Few Companies Put Forth the Effort to Formally Manage Risk



One of the key components of APQP methodologies is the incorporation of risk-based planning. Since most companies do not have a formal risk management process, the generation of PPAP documents are often the first attempts by a company to formally understand and analyze risk. Typically, the current process can be described as ***"We know a hard part when we see it"*** and the risk management approach is ***"When we have a hard part, we put our best people on it and have an engineer follow the first few jobs through the plant to make sure it is processed correctly."***

While this certainly has the basic components of a risk management plan:

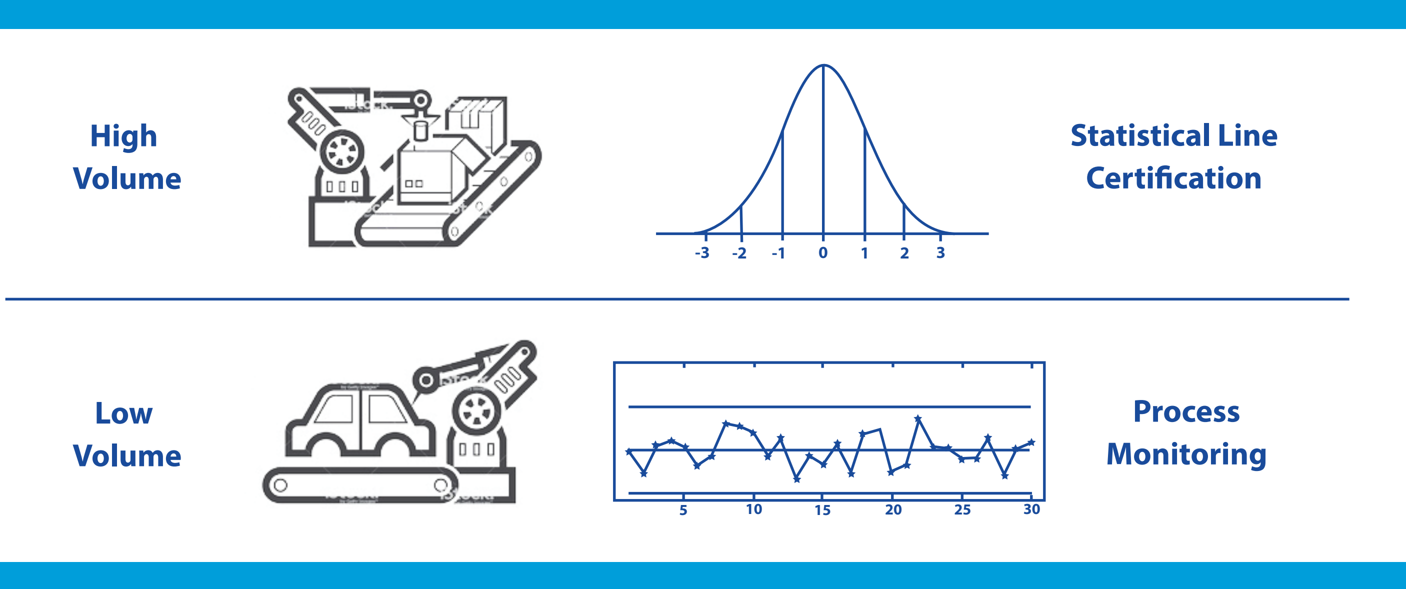
Identification: **We know when we see it**
Mitigation: **Put our best people on the first job;**
Engineer closely monitors job.

It can hardly be described as a robust approach, and doubtful that this process will pass muster during an audit.

2 The Approach for PPAP is not the Same for all Industries

The statistical approval of the production process is generally a requirement under APQP. This is where the PPAP comes into play. This process was originally developed for the automotive industry to evaluate and commission a production line prior to large volume production. This comprehensive PPAP approach has proven to be very valuable for these large volume industries.

The problem occurs in lower volume industries (e.g., aerospace, medical, etc.) where the quantity of parts required to statistically validate the process can frequently far exceed the quantity of the order, and sometimes represents years of demand. The inability to modify the PPAP requirements to suit the realities of low volume industries presents a major barrier to companies in these industries adopting APQP methodologies.



3 Much of the Knowledge about a Company's Manufacturing Process is not Formalized

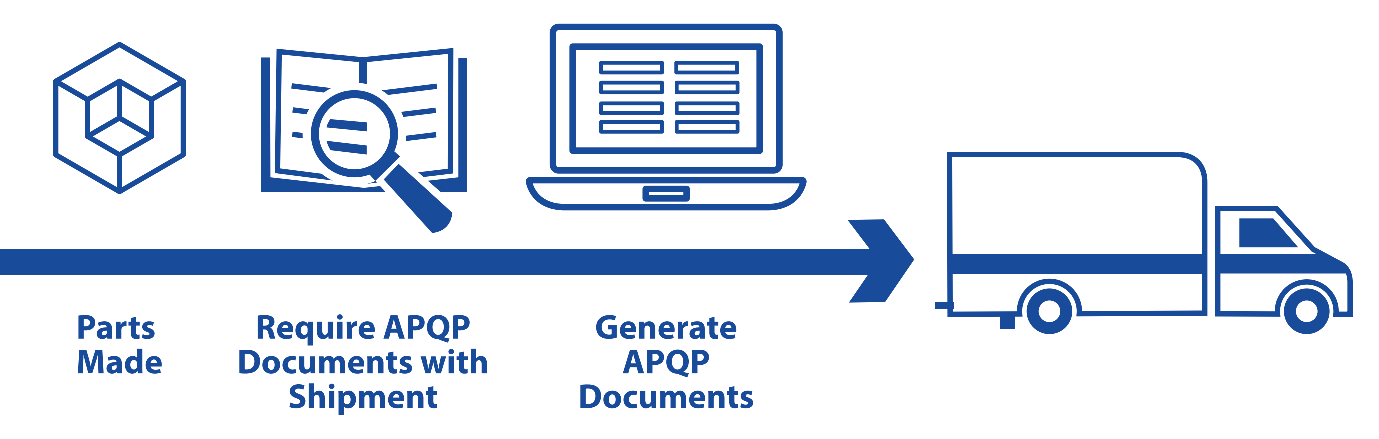
In many companies, senior engineers know how to interpret the customer requirements into the current manufacturing and inspection planning system. Typically, these systems have known deficiencies but the results have been accepted by numerous customers and third-party audits. Frequently the process for creating the planning documents is based on "tribal knowledge" with this knowledge residing with experienced employees. This leads to a reliance of on-the-job training and mentoring to enable younger engineers to be accurate and efficient in the creation of plans.

In many environments, the engineers are focused almost entirely on requirements, leaving the actual methods for making a part vague and unclear. The step-by-step instructions describing how to perform an operation is left up to the production operators. Since the operators are the subject matter experts in the execution of the work, it's clear that operator involvement in the generation of instructions is required. However, in many instances, these detailed instructions are not defined or updated. This leaves the operators to create their own directions that are frequently written in personal notebooks.

To generate a robust Process Failure Mode & Effects Analysis (PFMEA), production operator involvement is required. The lost efficiency and output from involving production operators is perceived to be too costly. As a result, the engineering-generated PFMEA lacks sufficient detail and is not useful to operations.

4 Many Companies Create PPAP Reports Only AFTER the Fact

Many companies treat the APQP requirements as a contract deliverable and much of the work is addressed immediately prior to shipping. The generation of the PPAP documents is often left up to quality after the parts are manufactured. This prevents the company from gaining any value from the generation of these documents. In this manner, the perception that APQP is an additional requirement with limited value is self-fulfilling. It is important to remember that the "A" in APQP stands for "Advanced" rather than "After".

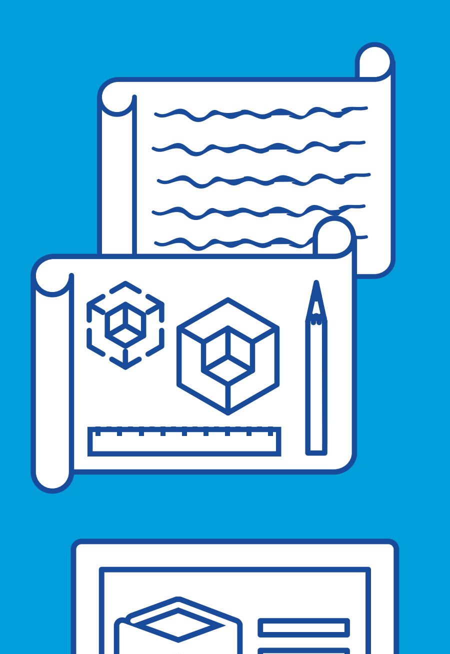


5 APQP Efforts Often Do Not Get Incorporated into the Actual Manufacturing Plans

When PPAP documents are generated after the parts are produced, they are generated with the primary objective of creating deliverables for the customer rather than for being useful in the management of the operations. These documents are created in silos without involvement of the people that actually run the process. In the absence of a formal risk management process, the quality of the document is left up to the individual engineer. These inconsistencies lead to documents that are insufficient to impact the production processes. For example, the results from the process control plans are often not incorporated into the shop floor work instructions, which obviously defeats the purpose of the overall APQP process.

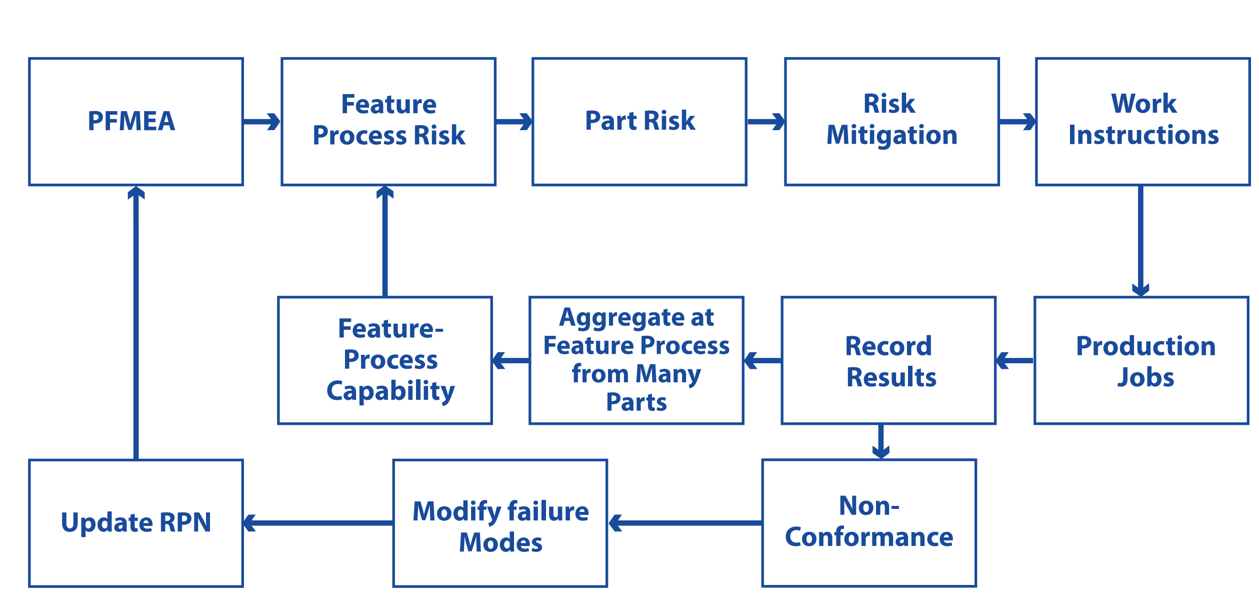
APQP is an extremely useful tool for all companies to better manage their processes, improve yields, and identify and mitigate risk in the production process. The above barriers are preventing many companies from reaping the benefits of this process. As more and more companies are required to devote the resources to generate these PPAP documents, shouldn't the expended resources create something useful?

DISCUS ENG | Risk Management using DISCUS ENG



At DISCUS Software Company, we believe that instead of responding to these requirements in a way that limits the benefits, the better position is to pursue an approach that can harvest the benefits in the standard planning process. DISCUS ENG is designed with the explicit goal of embedding APQP methodologies into the business process for creating manufacturing and inspection plans.

DISCUS ENG – Engineering Next Generation – provides a fine-grained computerized representation of parts and processes that enables unprecedented automation. DISCUS ENG directly incorporates risk evaluation in the planning process by allowing companies to create PFMEAs and connect them to the manufacturing process/operation. In this manner, part-level risk can be quantified as a summary of all of the operation-level risks. No longer is the risk merely an assessment from individuals but quantified from the agreed output of the PFMEA. This quantification of risk is available when cost estimates are created improving the accuracy of the estimate and providing a data-driven definition of the frequently used complexity factor in the estimating process.



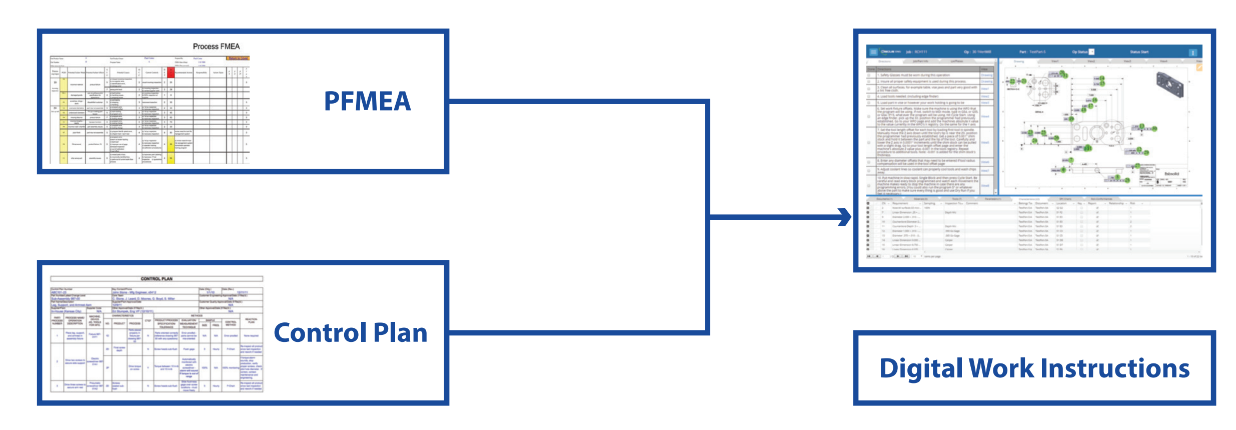
Since DISCUS ENG is collecting actual inspection results of characteristics, the PFMEA data can be updated based on actual production results. The risk calculation data includes:

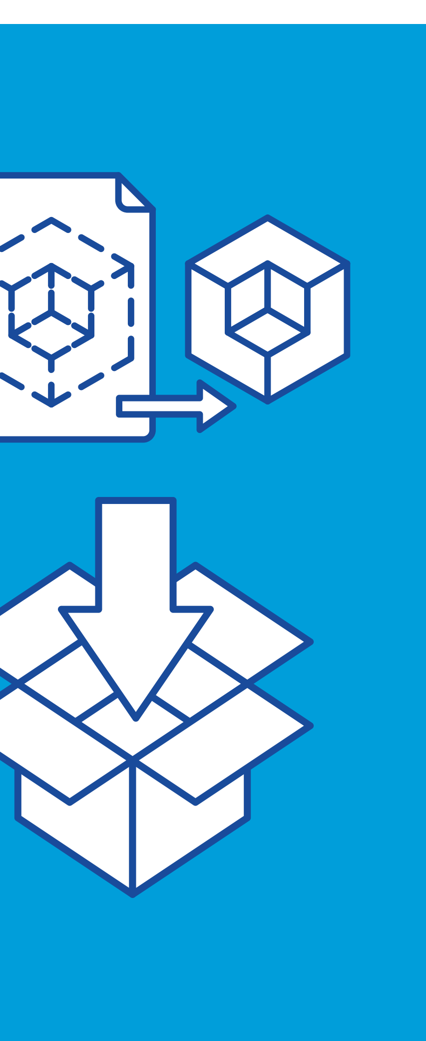
Frequency of occurrence
Probability of being detected
Create new failure modes

DISCUS ENG embeds risk management in the creation and maintenance of manufacturing and inspection plans. DISCUS ENG facilitates the creation of PPAP reports in the following manner:

Monitors the output of the process - Collection of inspection data is related to the part, its operation and the process. Statistics can be generated for the overall operation/process enabling the calculation of capability statistics for the process. DISCUS ENG also allows for real time process capability monitoring to continually evaluate the statistical capability.

Assembles the data – Collection and recording of inspection results. PPAP reports can be generated directly from the database greatly reducing the time to create the report for submittal.





DISCUS ENG allows for the easy publication of digital work instructions. This enables the engineers to generate robust step-by-step instructions augmented with easily-created annotated views, diagrams, and pictures. This provides complete step-by-step documentation of the process leveraging previously approved instructions for the same process on different parts. DISCUS ENG allows for feedback from operators to further document the process through uploading of photos and operator comments.

DISCUS ENG allows for both part characteristics and process parameters to be recorded at the operation. Engineering may define sample frequencies and reaction plans directly into the digital work instructions. This enables the control plan to be an integral part of the work instructions.

DISCUS ENG uniquely incorporates APQP methodologies in the processes for creation of manufacturing and inspection plans. There is no need to create separate business processes to comply with customer-mandated APQP requirements. Instead APQP becomes part of the engineering business processes allowing companies to truly harvest the benefits.