

Management of Production Processes and Products Release Procedure

Florina-Cristina Filip, Vladimir Mărăscu-Klein

Abstract—This paper describes the production process and product release procedure used by supplier as a management method of proving that all product requirements agreed with the customer are being met. This method applies to the processes involved in the manufacture of products (raw material, semi-finished products, components and chemical operating materials). The release comprises an assessment of the production process or service based on the relevant documents, records and initial production samples, to ensure that the requirements associated with the production process of products which conform to specification are met. The supplier must to ensure that he agreed with the customer on changes of production process or deviations from specifications, at an early stage.

Index Terms—initial production, inspection reports, release, supplier.

I. INTRODUCTION

In a global business environment with an incredible pace of change, to succeed must be smart, easily adaptable and efficient, all at once. Production process and product release is the most important element of implementing framework management methods. An optimal process allows production of a product from the raw material to finished product without interruptions and delays (loss) [1]. The best-known production processes are the planning requirements and its successor manufacturing resources planning [2], [3].

The challenges facing manufacturing companies in many developing countries include adopting the right management methods and measures, used efficiently and with continuous improvement of production processes in order to stay abreast on market [4], [5]. Framework management methods and effective technologies are recognized as the most important factors for remaining competitive in the global business environment [4], [6]. When the production of a certain product is released to a second process, it is very important to achieve identical quality from both production processes. This ensures that customers who receive the product will not notice any difference between production processes [4], [7].

Satisfaction of customers' demands and maintaining the production efficiency are achieved by the process flexibility [1]. Customer satisfaction means a stable production and continuous improvement of production, adapting to many external factors which are in a permanent transformation and have to adapt to the management changes, suggesting a continuous motion, process improvement and interdependence inside, with a major drop in production costs, means and corresponding materials and ensuring the

environmental protection by implementing proper management methods [1]. The current environment, in which many industrial companies operate, is characterized by intense competition, with an increasingly prominent role of new production process and product release. In this context, define framework management methods and suitable measures as continuous improvements are a weapon for maintaining and improving competitiveness, making use of the knowledge and the involvement of company's workers [8],[9]. Inspired by the dramatic improvements demonstrated, many companies have undergone a process improvement programme and have found that the application of production process improvement methods has led to significant improvements in operational management areas [8], [10]. Often, major improvements take place over time as a result of numerous incremental improvements. On any scale, improvement is achieved through the use of a number of management methods and measures dedicated to searching for sources of problems and finding ways to minimize them [8], [11]. Any improvement may be reached in two ways. One the one hand, management improvement can mean an increase in terms of quantity for resources and/or activities and on the other hand, improvement can mean a higher quality for resources and/or activities [8], [12]. The production process supports the release of high-quality products by providing the project staff and managers at all levels with appropriate visibility into and feedback on processes and associated products [13], [14]. Production process quality is the guarantee for quality of good products release [13], [15] and often, a large number of variables contribute to a product's quality. For example, for consumer durables, factors such as performance, reliability and serviceability may affect consumer experiences with the product [13], [16]. Quality is a lengthy process that cannot be achieved overnight [17]. Methods and techniques used for quality processes include peer reviews such as inspections or structured walkthroughs and the different levels of testing [13], [18], [19]. Production capacity is one of the most important measures of resources used in production process. Its definition and analysis is therefore one of the key areas of production process [20], [21]. Capacity management is a significant issue in the high-tech industries where the manufacturers are confronted with capital intensive facilities and highly skilled labor, operating under long manufacturing lead-time, short product life-cycle and near-continuous technological innovation [20], [22].

II. PRODUCTION PROCESS ASSESSMENT

For initial production sampling and thus prior to product release, the supplier is solely responsible for assessing the effectiveness of his production process. A trial production

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Florina-Cristina Filip, Department of Engineering and Industrial Management, Transilvania University of Brasov, Brasov, Romania.

Vladimir Mărăscu-Klein, Department of Engineering and Industrial Management, Transilvania University of Brasov, Brasov, Romania.

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run takes place to establish whether the existing production process is capable to manufacture the products to the customer's required quality with the agreed production capacity, for a stipulated period or of providing the relevant services. In order to furnish proof of the planned output, the following must apply:

- all production equipment (e.g. installations, machinery, tools, inspection equipment) must be in operation,
- in situ,
- using production material,
- working to full capacity,
- using standard personnel,
- and all supporting systems.

A batch size which is representative of the process (usually daily requirement from annual requirement) should be used to assess the production process. The date and scope of process assessment are agreed between customer and supplier within the framework of the advanced product quality planning (APQP). A distinction is made between various sample types as: prototypes and initial production samples. Prototypes can originate from provisional production processes and unless requested otherwise by the customer in his order, the following constitute the minimum requirements for prototype sampling:

- Inspection record with nominal/ actual comparison of at least one product, e.g. by means of an entry in the drawing;
- For prototype tools with several cavities: nominal/ actual comparison of one product per cavity;
- Marking of checked prototype parts for allocation to inspection record;
- Indication of material composition.

Initial production samples are products or services which have been manufactured or produced in full using standard operating materials and under standard conditions. They must be taken from a batch size which is representative of the production process. Initial samples must always be submitted by the supplier, on his own initiative, in the event of the following:

- New products (e.g. a specific product, subassembly or material which has not been supplied to the customer before);
- Changes to the product involving the drawing, specification or material;
- Changes to the drawing or specification which does not affect the product or function. The scope of the sampling process and the submission level must be agreed with the recipient site;
- Elimination of a defect in a product that has already been sampled previously, i.e. the release was subject to conditions or initial samples were discarded (repeat sampling);
- Production interrupted for extended period (no production for more than 12 months in cases where deliveries were previously made at least four times a year);
- Receipt of delivery at another site. The scope of sampling process and submission level must be agreed with the recipient site.

Following prior notification by the supplier in accordance with approval request/ special release, the scope of sampling process is defined by the customer in event of following:

- Changes to the production process;
- Change of subcontractor for raw materials or purchased products;
- Production which uses tooling, machinery or installations which are to be transferred to a different production plant of the supplier;
- Use of new tooling (with exception of wear tooling);
- Use of additional or replacement tooling (multiple cavity tooling);
- Production which uses existing tooling, machinery or installations that have been over-hauled or modified;
- Significant changes to inspection or test methods released through preliminary sampling.

Supplier must submit initial production samples at the customer's request following serious quality problems and as part of the periodic requalification of products.

III. DOCUMENTATION

The supplier must prove that all features correspond with the customer's specifications, e.g. drawings including the corresponding technical delivery conditions and specifications, by specifying the inspection results in the inspection report for initial production samples. Deviations must be clearly shown in the inspection report, unless agreed otherwise in writing, the storage period for documentation relating to initial production samples, as well as for reference sample product (one per cavity in cases where multiple cavity tooling is used) is the agreed life of the product plus one year. Where possible, the documentation should be sent electronically to the relevant sampling department at the customer's recipient plant in advance. Where this is not possible, it should be included with the initial production samples or delivery papers.

A clear reference to the inspection report must be established through the consecutive numbering of the features in the drawings, including the corresponding technical delivery conditions and specifications. Features which cannot be checked by the manufacturer are, by agreement with the customer in good time, either confirmed using certification by means of specific test results (material certificate) or proved by means of inspection certificates from accredited inspection institutes. The preliminary process capability of the characteristics identified specifically in the customer drawing or by means of applicable specifications is determined from a minimum of 125 products (25 samples of 5 products). A minimum of 10 products must be checked for destructive testing and a minimum of 300 products for attributive testing.

Where parts are required to have a defined appearance in accordance with a drawing regulation or specification, this feature must be rated accordingly in the inspection report. The inspection report for initial production samples must include confirmation that the materials used and their substances comply with the customer's requirements where the environment, recycling and safety are concerned. Transport containers and delivery paperwork from

consignments of initial mass production samples must be clearly marked initial sample. If the initial mass production samples cannot be delivered in the designated mass production packaging, the supplier must ensure by means of suitable packaging that the quality of the samples is not impaired by damage or corrosion.

The production process and product release procedure must be completed in full by the supplier and documented. The stipulation of a submission level by the customer defines the type and scope of initial production sampling which is to be provided for the customer. The requirements associated with the relevant submission level can be found in Table 1.

2	Product submission warrant with sample products and limited supporting data/ documentation are submitted to the customer.
3	Product submission warrant with sample products and complete supporting data/ documentation are submitted to the customer.
4	Product submission warrant and other requirements defined by the customer within the framework of advanced product quality planning.
5	Product submission warrant with sample products and complete supporting data/ documentation are available to the customer for review at the supplier's production site.

Table 1. Requirements of relevant submission level

Level	Requirements
1	Only the product submission warrant is submitted to the customer and, if additionally requested by the customer, an appearance approval report.

Unless defined otherwise by the customer in the order, the supplier should generally follow submission level 3 (Table 2).

Table 2. Requirements of relevant submission level

No.	Element/ requirement	Explanation/ comments	Submission level				
			1	2	3	4	5
1	Design records	Customer drawing (marked characteristics drawing)					
		Specification, product delivery guideline, technical delivery conditions (marking of characteristics)	R	S	S	*	R
		For components developed by supplier on own responsibility	R	R	R	*	R
		For all other components	R	S	S	*	R
2	Modification documents	Documents on changes approved by the customer, which are not yet documented in the drawing, if available	R	S	S	*	R
3	Design release from the customer	Design approval from the customer, if requested in the customer drawing	R	R	S	*	R
4	Design FMEA	Only applicable to suppliers with design responsibility. Cover sheet to design FMEA, including current modification level, date and group of participants, as a minimum.	R	R	S	*	R
5	Process flow diagram(s)	Process flow diagram for the product or the product family	R	R	S	*	R
6	Process FMEA	Cover sheet to process FMEA, including current modification level, date and group of participants as a minimum	R	R	S	*	R
7	Control plan	Control/ inspection plan as a minimum for all special characteristics for the product or the product family	R	R	S	*	R
8	Measurement system analysis study	Inspection equipment capability study of inspection equipment for all special characteristics	R	R	S	*	R
9	Dimensional measurement results	Inspection report on all dimension characteristics in the customer drawing and by means of applicable specifications, including OK/ not OK rating	R	S	S	*	R
10	Material test results and function test results	Material inspection report on all material data in the drawing and all by means of applicable specifications, including OK/ not OK rating.					
		Substances must be entered into the international material data system (IMDS).	R	S	S	*	R
		Evidence on the use of prohibited substances and substances requiring declaration.					
		Inspection report on all function features in the customer drawing and by means of applicable specifications, including OK/ not OK rating.					
11	Process capability study	Process capability evidence for all special characteristics in the customer drawing, and other features specified by the customer, and by means of applicable specifications.	R	R	S	*	R

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12	Documentation from the test laboratory	If an external laboratory has been appointed, the laboratory's test results and the ISO 17025 certificate must be submitted with specification of the scope.	R	S	S	*	R
13	Report for appearance-critical parts	If requested by the customer and specifically agreed within the framework of advanced product quality planning.	S	S	S	*	R
14	Sample parts	Check five sample parts, unless specified otherwise. Deliver parts in production packaging in accordance with packaging data sheet.	R	S	S	*	R
15	Reference sample part	At least one reference sample part per cavity should be stored by the supplier for the life of the product, plus one additional year. The allocation to the initial sample inspection report should be ensured by means of clear marking.	R	R	R	*	R
16	Inspection equipment/ inspection aids	Dropped (only if specifically requested)	*	*	*	*	*
17	Compliance with customer requirements	Dropped (only if specifically requested)	*	*	*	*	*
18	Part submission warrant	Part submission warrant	S	S	S	S	R
19	APQP status report	For project classification PE 1 or PE 2 in accordance with advanced product quality planning	R	S	S	*	R

S Submit to customer

R Retain and keep available for immediate access at customer's request

* The decision on whether to submit (S) or retain (R) the individual elements is agreed specifically between customer and supplier during the course of the APQP

Following submission of the initial production samples and inspection reports, the customer carries out further inspections at his own discretion, which can also take place at the supplier's premises in the case of submission level four or as part of a trial production run. One of the following decisions is made on the basis of the initial sample inspection reports and the inspections carried out by the customer approved, conditional approval (new initial sampling required) and rejected (new initial sampling required). The initial production samples must be released by the customer before the production products can be delivered.

VI. CONCLUSION

Production process is a strategy designed to increase the flexibility of operations in order to produce an increasing variety of products in smaller quantities while simultaneously reducing operating costs and increasing the utilization of the workforce. Product release process consist in a production which uses manufacturing equipment, tools and people organized to perform an entire sequence of operations in one physical location. The overall responsibility for the production process and product release lies with the project manager at the delivering plant, except for when the receiving plant is technologically more advanced than the delivering plant.

The product release extended over a longer period of time can be divided into several release stages. At the end of each phase it is necessary to know the status of production process. In the case of release, an audit is to be planned at the delivering plant prior to product release and at the receiving plant once the release is complete. The potential risks for product release is identified from a structured, overall

assessment viewed from different perspectives and based on defined criteria, data and processes. The aim is to identify the potential risk associated with implementing a release process and the subsequent documentation of decision on production process, as well as the definition of framework management methods and suitable measures with the responsible persons in order to reduce the risks. During the production process, the project manager coordinators develop and implement the necessary management methods and measures. The main aim is to ensure communication and consultation with all affected parties of improvement, as well as customers or suppliers. In addition, handling of deadlines, costs and quality are clarified. The improvement process is carried out first on a management level.

Once products have been released, changes to production process are only permissible once formal approval has been obtained from the customer. To this end, the supplier is responsible for informing the customer contact indicated on the order of any intended changes in good time, using the corresponding application form. In the event of a deviation from a drawing or specification, a special release must be obtained via the customer contact stated in the order before delivering the product to the customer. This also applies if there is to be a short-term deviation from the approved production process, e.g. use of a different process or a different machine. In order to correct the deviation(s), the supplier must define framework management methods and suitable measures, stating the persons responsible and the relevant deadlines and include this information with the application. The suitable management methods and measures must be included with the application for special release. Depending on the circumstances, a special release is

either restricted to a defined delivery period or a defined delivery quantity. This is specified by the customer in the application. The supplier may only introduce the changes once the relevant technical department at the customer's premises has reviewed the effects of changes and issued an approval. Then, the supplier must receive notification of the customer's approval/ release in written or electronic form before delivering the relevant products. Initial production sampling to production process and product release procedure is required upon introducing the change and a copy of the customer's special release must be included with the delivery papers and also applied to the packaging units, ensuring that it is clearly visible.

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First A. Filip received the B.S. degree in Economical Engineering from the Transilvania University of Brasov, Romania, in 2007, the M.S. degree in Management of Production Systems from the Transilvania University of Brasov, Romania, in 2009, and the Ph.D. degree in Industrial Engineering from the Transilvania University of Brasov, Romania, 2012, respectively. Currently, she

is an associate Professor at Transilvania University of Brasov. Dr. Filip may be reached at



Second B. Mărăscu-Klein received the B.S. degree in Industrial Engineering from the Transilvania University of Brasov, Romania, in 1976, and the Ph.D. degree in Industrial Engineering from the Transilvania University of Brasov, Romania, 1993, respectively. Currently, he is an Professor at Transilvania University of Brasov. Dr. Mărăscu-Klein may be reached at