

# Unique Identification in Investment Castings Using Modern MRP/ERP Software Provides Traceability for Safety Critical Components

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The investment casting industry produces castings for a multitude of industries including the aerospace, defense, nuclear, and automotive segments. Many of the investment castings produced are safety-critical components that require traceability through serial numbers and unique identifiers. A safety-critical component is defined as a component where the performance or tolerance is essential to the safe operation of the system to avoid death, injury, loss of equipment or property, or damage to the environment.

Examples of investment casting safety-critical components would be nuclear power plant pump assemblies, aerospace fan blades, and automotive brake components. These are the types of components that you do not want to fail under any circumstances.

The importance of traceability has been well documented in the crash of United Airlines Flight 232 at Sioux City, Iowa on July 19, 1989 and the subsequent investigation by the National Transportation Safety Board (NTSB). Although the root cause of failure in this crash was a titanium forging, lessons from this failure apply equally as well to the investment casting industry and stress the need for traceability.

In the crash of UAL232, the fault was traced to a critical failure of a fan disk caused by a bore-to-rim fracture. According to the NTSB Aircraft Accident Report issued Nov. 1, 1990, the fan disk had a serial number of MPO 00385 and a heat number of K8283 melted on Feb. 23, 1971.

Each investment caster involved in making critical components should question if he can truly provide the traceability required in the manufacture of safety-related parts. Modern generic enterprise resource planning (ERP), and material requirements planning (MRP) computer

systems often lack the ability to provide the full traceability required in the investment casting industry. However, several metalcasting-specific software suites are available to investment casters. The ability to use an ERP/MRP system tailored specifically to the industry is of utmost importance.

Metalcasting is unlike any other manufacturing process in that liquid metal forms the basis of the end product, and molds that are used in the process are destroyed during the creation of the end product. Investment casting stands apart from other metalcasting manufacturing processes in that the castings have the

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qualities of complexity, superb surface finish, high dimensional accuracy, and no flash or parting lines.

The benefits of investment casting, however, come hand-in-hand with a complex process.

Within the investment casting industry, the ability to trace a part from inception, through investment, all the way through the final product is often a prerequisite for doing business involving safety related components. Most traceable parts only require traceability from the metal pouring stage onwards as there is not a unique identification number available until after the casting has been poured.

There are two broad process control methodologies regarding the serialization of castings. In order for a casting to be

serialized, it must be marked with a serial number or a unique identification number. Generally, this identification is embedded into the casting at the commencement of the investment casting process. Although technology does exist to laser etch identifications into the casting after the investment process itself, the unique identification is generally incorporated at investment time.

Decisions must be made as to when the recording of the unique identification is made into the computer system for tracking and analysis. The decision is ultimately based on the nature of the safety-related component and the customer specifications. By performing the recording of the unique identification number from the commencement of the process, a full traceability of the casting is assured.

The advantage that metalcasting-specific ERP/MRP software has over generic software solutions is that the specific needs of the investment caster are taken into account. As previously noted, metalcasting is uniquely different from other production manufacturing processes and investment casting is a specific individualized subset of metalcasting. In evaluating software solutions for investment casting operations, the following points should be considered:

1. Is the software metalcasting specific or is it a generic software package that is being forced fit to your specific needs?

2. Is the metalcasting-specific software capable of handling the specific and discrete needs of the investment casting operations?

3. Does the software solution provide for unique identification/serial number traceability?

4. During the input and tracking of unique identification numbers, is the process of inputting and maintaining unique identification numbers labor intensive or does the software provide streamlined methods for accomplishing full traceability?

5. Are quality plans, certifications, and batch traceability available within the software solution?

6. As the wax injection process of investment casting is a critical stage, can the software retain information relating to the binder, pressure, temperature, injection time, etc.?

7. Shellbuilding is also a critical component of the investment casting process, does the software facilitate the storing of information related to the coats?

8. Some investment casting setups are very complicated. Does the software support images and video of the process as a form of quality documentation?

9. Does the software support the ability to track two “bind quantities” and the quantity per injection for the wax and the quantity per tree?

10. Does the software have varying methods of automatic serial number allocation (serialization by part, serialization by melt number/casting etc.)?

Investment casting is a special subset of the metalcasting industry. It is often necessary for the investment caster to be able to provide full traceability for the casting, especially when the casting

is a safety related component. Modern metalcasting specific ERP/MRP software can provide the tools necessary to meet the ever increasing global demands for quality castings.

*Information obtained from: National Transportation Safety Board PB90-910406 NTSB/AAR-90/06; AirDisaster; Aero-News; Planecrashinfo; Synchro32.*

Unique ID Booking

Single ID  Multiple ID's

Select Multiple ID's

- UQ/4
- UQ/5
- UQ/6
- UQ/8

Quantity

Job Number: JB/462 Original Job: JB/462 Batch/Heat ID: L45/Q11 Spare 1: [ ]

Customer Product Reference: 9983/1 Spare 2: [ ] Spare 3: [ ]

Part Number: D895/B757-L5 Customer ID: JB/462 Spare 4: [ ] Operator: Fred Smith

Current Stage: Allocated (not booked) Notes: [ ]

Quality Plan Update Only

Move WIP  Report Scrap  Ship/Bill

Move to process: 2 TB Heat Treat

Booking Date: 09/08/2010

Set Shortcut On/Off Book Now

Specific investment casting needs and multiple IDs can be accommodated with modern metalcasting-specific ERP/MRP software.