



*Challenge Accepted: This drafting technique provides suppliers with the organization necessary to show conformance to auditors and employees.*

## Method means comparing checklists vs. procedure

**W**hether commercial heat-treating or captive, procedures are essential to the production of conforming product and its repeatability. Procedures can be challenging to write at times as, if we are too close to the process, we may feel that some items in procedures are obvious. Still, it is also difficult to assign authorship to an employee who is not as familiar with the process as, say, a process engineer.

In this article, we will examine a technique to writing heat-treat procedures that not only accounts for the specific requirements as they apply to a facility but up to the Nadcap level.

### APPLICABILITY

Let's first establish customer and specification applicability. As an example, if processing to internally developed parameters that have no specification flow-down, but are Nadcap-approved, you would need to include both Nadcap checklist items as well as requirements as they apply to your own internally developed (and, possibly, customer-approved) process in the procedure. On the other hand, if processing to an AMS/SAE specification that is flowed down to via customer PO/Print and is Nadcap-approved incorporation of internal process requirements, AMS/SAE requirements as well as Nadcap checklist items would need to take place.

These items are typically identified during the contract review process. It is important to have a clear line-of-sight to your specific requirements as they apply to all hardware processed. This can enable suppliers to establish general higher-level procedures in place of low-level requirement-specific procedures (i.e. one procedure for, say, Rolls Royce parts and another for GEAE parts in heat treat).

I will use an example of a common scenario to begin this description. Let's assume Company X heat treats 410 stainless steel in accordance with the customer PO/Print which flows down AMS2759/3. With AMS2759/3, Company X is also required to maintain Nadcap-approved in heat treat.

### GENERAL REQUIREMENT ACCOUNTABILITY

A simple start to this would be to funnel the requirements into three general procedures;

a general heat-treat procedure, a general pyrometry procedure, and a general hardness testing procedure. This will allow all the requirements of each process to be in a single location when future changes are necessary.

The general heat-treat procedure should include the heat-treat process requirements flowed down in AMS2759/3 (and, in this case, AM2759) as well as AC7102. The pyrometry procedure would include applicable requirements from AMS2759/3 (AMS2759) as well as AMS2750. The hardness testing procedure would include the requirements of ASTM E-18.

The key is the structure of the procedures. During my years con-

3.1	Document Control			
3.1.1	Are the applicable revisions of the appropriate documents available at the appropriate workstation?	YES	NO	
3.2	Contract Review			
3.2.1	Are contracts and incoming purchase orders reviewed to ensure that (U22)			
3.2.1.1	The quality and technical requirements, including any unique customer requirements, are adequately defined and documented?	YES	NO	
3.2.1.2	Adequate capability, customer approvals and resources by the processor to meet the requirements?	YES	NO	
3.2.1.3	Any deviations from the proposal/contract are resolved in writing by authorized personnel/Customer/Auditee?	YES	NO	
3.2.1.4	Adequate definition of the work statement to identify the specific process(es) to be performed including specification number(s), applicable Type(s), Class(es), Grade(s), etc.?	YES	NO	
3.2.1.5	Identification of the prime aerospace customer that has design authority?	YES	NO	
3.2.1.6	Identification of the aircraft model or hardware that the part numbers represent where applicable. (e.g. Boeing 777, Airbus A320, etc.)?	YES	NO	NA
3.2.1.7	Does the Auditee flow down contractual requirements internally and to sub-tier Suppliers?	YES	NO	
3.3	Control of Nonconforming Product			
3.3.1	Is the nonconforming material controlled, and the customer notified of each instance of nonconforming product in accordance with the contractual requirements?	YES	NO	
3.3.2	When reheat treatment is performed: is it allowed by specification, properly documented, retested, and in compliance with customer requirements? (U22)	YES	NO	NA
3.4	Corrective Action			
3.4.1	Are all corrective actions from the previous Nadcap audit still implemented (check the last full audit)?	YES	NO	NA

Figure 1



An approach to writing procedures may be to start, say, the AC7102 Nadcap checklist. This would go into the general heat-treat procedure. The flow could mimic the flow of the checklists to ensure a supplier has captured all the requirements within AC7102.



sulting with companies, I've seen procedures that appear to have had requirements inserted due to audit findings and/or specification changes with no real organization or flow. I've also seen procedures that essentially plagiarize the parent specification/checklist. Of course, I would strongly recommend against this approach, as it does not show an auditor how a supplier has accounted for specific requirements within the specification.

An approach to writing procedures may be to start, say, the AC7102 Nadcap checklist. As stated before, this would go into the general heat-treat procedure. The flow could mimic the flow of the checklists to ensure a supplier has captured all the requirements within AC7102. (See example in Figures 1 and 2).

### COMPARISON OF CHECKLISTS VS. PROCEDURE

Each major topic within the checklist has its own paragraph within the procedure describing how that specific supplier addresses the checklist requirement.

This same approach can be used for specification requirements (i.e. prime, SAE/AMS, etc.). This may include tables showing temperature requirements for specific materials as well as specific process requirements as they are described within the applicable specification.

### SUMMARY

Drafting internal procedures in this way gives suppliers the organization needed to clearly show conformance to both auditors as well as employees who need to conform to the procedures. This system also allows for insertion of new requirements as both checklists and specification revisions are released. ♪



### ABOUT THE AUTHOR

Jason Schulze is the director of technical services at Conrad Kacsik Instrument Systems, Inc. As a metallurgical engineer with 20-plus years in aerospace, he assists potential and existing Nadcap suppliers in conformance as well as metallurgical consulting. He is contracted by eQualearn to teach multiple PRI courses, including pyrometry, RCCA, and Checklists Review for heat treat. Contact him at jschulze@kacsik.com. More info: www.kacsik.com.

**21. Document Control**

21.1. Documents applicable to heat treat shall be retrieved per *XYZ Procedure*.

21.2. Part and/or material specific controlled work instructions shall be retrieved each time a heat treatment is processed. Previously printed instructions shall not be used.

**22. Contract Review**

22.1. Contract review for product to be heat treated shall include the following items:

22.1.1. All quality and technical requirements, including any unique customer requirements, are defined and documented.

22.1.2. RSTW shall ensure the furnace is capable and certified to meet the requirements (i.e. temperature tolerance, testing frequency etc.).

22.1.3. Any deviations to a proposed contract shall be resolved with the customer in writing prior to processing parts.

22.1.4. The flow down shall include the definition of work statement which includes any material class or other specific requirements.

22.1.5. The identification of the prime aerospace company which has design authority shall be documented when available.

22.1.6. When applicable, the identification of the applicable engine model that the part numbers represent.

22.1.7. All specification and customer requirements shall be flowed down to sub-tier suppliers where applicable.

**23. Control of Nonconforming Product**

23.1. Nonconforming material shall be segregated from conforming material *XYZ Procedure [insert nonconforming material procedure]*.

23.2. Disposition of nonconforming heat treatments must be obtained from the PO holder as *Company X* does not have design authority over commercially heat-treated product. Any product which *Company X* does have design authority over shall be dispositioned by *Company X* QA/Engineering for further action.

Figure 2