

## Structuring and preparation of a lesson: EAS module 8 (Quality management)

time	Theme, core information, statements or questions	Learning objectives <sup>1</sup>	Methods (e.g. presentation/ discussion/group work)	Media/ training material
0,5 h	<p>Introduction the adhesive bonding process</p> <p>Adhesive bonding considered as a special process in ISO 9000.</p> <p><u>Adhesive joint quality assurance and reliability:</u></p> <ul style="list-style-type: none"> <li>- Can't be guaranteed</li> <li>- There are no suitable non-destructive; examination methods.</li> </ul> <p><u>Inspection of adhesive bonds:</u></p> <ul style="list-style-type: none"> <li>- Not feasible to assure quality;</li> <li>- Unnecessary activity in a well-controlled process.</li> </ul> <p>Assurance secured by systematic management and control of the whole operation from joint design to final assembly.</p> <p>Poor quality joints are reduced to a minimum when proven procedures are followed at all times.</p>	<p>Explain the importance of having a quality management system and control for adhesive bonding processes; (1)</p> <p>Explain why adhesive bonding is considered to be a special process, according to ISO 9000; (1)</p> <p>Discuss how the possibility of poor quality joints is reduced to a minimum when proven procedures are followed at all times; (2)</p> <p>Analyse the use of specific procedures for quality management and control of the whole operation; (3)</p>	<p>Introduce the ISO 9000 so the student realizes where can he get the information</p> <p>Discussion about the need of quality management and how it can be obtained. Give special highlight to the differences between adhesives and other joining processes.</p>	<p>Handout</p> <p>White board</p> <p>Part of ISO 9000 adequate for this chapter</p>
1 h	<p>Raw Materials Control</p> <p><u>Supplier certification</u></p>	<p>Explain how to correctly store all materials in the bonding process, making reference to all control</p>	<p>In small groups or individually, require a table with the main</p>	<p>Handout</p>

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	<ul style="list-style-type: none"> <li>- Status of all suppliers of any materials in the bonding process (adherents, consumables, adhesive, fixed equipment).</li> </ul> <p><u>Manufacturing system qualifications</u></p> <p><u>Incoming specifications</u></p> <ul style="list-style-type: none"> <li>- Defined by the final customer or manufacturer</li> </ul> <p><u>Testing</u></p> <ul style="list-style-type: none"> <li>- Required on any incoming materials, to prove compliance with the incoming specifications.</li> <li>- Test adequate to the process (e.g. viscosity, lap shear strength) or according to a specification and supplier's quality system.</li> </ul> <p>Correct storage of all materials in the bonding process, e.g. control of temperature, humidity, airborne dust, shelf life.</p>	<p>parameters which should be considered; (1)</p> <p>Control aspects regarding raw materials, such as supplier certification, manufacturing system qualification, incoming specifications and testing; (2)</p>	<p>topics that are involved in material control.</p> <p>Simple exercise where the students will have to select the best way to store</p>	<p>White board</p> <p>Exercise/example of material storage</p>
2,25 h	<p>Process</p> <p><u>Procedure specifications:</u></p> <ul style="list-style-type: none"> <li>- Documentation of all the process steps (adhesive storage and application, surface treatment, assembly, cure).</li> <li>- Bonding coordination should be considered here and in Module 5 (Bonding Process). It is equivalent to the Welding Coordination of EN 719.</li> </ul> <p><u>Staff training:</u></p>	<p>Explain the importance of documenting all process steps; (1)</p> <p>Control aspects regarding the process, such as procedure specifications, staff training and statistical monitoring methods; (2)</p> <p>Promote the use of feedback and problem solving in</p>	<p>Create groups of 2 to 3 students to make a list of all the process steps. Open discussion where each group exposes the steps and complete each other work. The professor has the responsibility of guide and expose</p>	<p>Handout</p> <p>White board</p> <p>Case study</p>

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	<ul style="list-style-type: none"> <li>- Documentation of skills, staff experience, and training required to achieve product reliability and to comply with the company's quality system.</li> </ul> <p><u>Statistical monitoring methods:</u></p> <ul style="list-style-type: none"> <li>- Measurements made during the process (flow rate, optical detection of adhesive bead, laminate thickness), data analysis and presentation of results (e.g. SPC charts) are crucial steps for a continuous process improvement.</li> <li>- Methods of feedback and problem solving.</li> </ul>	<p>monitoring methods; (3)</p> <p>Compare staff qualifications to the ones required to achieve product reliability and to comply with the company's quality system; (3)</p> <p>Monitor process control continuous process; (3)</p>	<p>the missing elements.</p>	
2,25 h	<p>End-product Control</p> <p><u>Visual Inspection</u></p> <ul style="list-style-type: none"> <li>- Simple approach to verify if the process is correct, e.g. joint appearance, alignment, visible excess adhesive.</li> </ul> <p><u>Physical Inspection</u></p> <ul style="list-style-type: none"> <li>- Measurement of a useful feature to verify if the product was correctly made.</li> </ul> <p><u>Non-destructive Tests (NDT)</u></p> <ul style="list-style-type: none"> <li>- NDT available to detect flaws or failed products, e.g. ultrasonic C-scan, electrical measurement, gas leak test.</li> </ul> <p><u>Destructive Tests</u></p> <ul style="list-style-type: none"> <li>- Parallel test pieces (witness samples) to be</li> </ul>	<p>Be familiar with the different types of inspection and test that can be used as a mean for end-product control, such as visual and physical inspection, destructive and non-destructive tests, sampling and statistics and its limitations; (1)</p> <p>Apply appropriate methods for end-product control; (2)</p> <p>Monitor end-product control process; (3)</p>	<p>As the trainer presents the examples, discuss each end-product control. Presentation of examples.</p>	<p>Handout</p> <p>White board</p> <p>Presentations of students</p>

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	<p>used for destructive testing. Tear-down of a complete product, with an agreed frequency or in the event of a dispute.</p> <p><u>Sampling and Statistics</u></p> <ul style="list-style-type: none"> <li>- Procedures for samples.</li> <li>- Frequency and cost of sampling to ensure process capability.</li> <li>- Statistical techniques.</li> </ul> <p><u>Limitations of end-product control</u></p> <ul style="list-style-type: none"> <li>- After the joint has been made.</li> </ul>			
1 h	<p>Available Quality Tools and Techniques</p> <p>Overview of the main quality tools and techniques, what they can do and when they should be used.</p> <p>Presentation of the seven basic tools and after advanced tools, e.g. QFD, Taguch, FMEA, Ishikawa diagrams, Pola-yoke.</p>	<p>Identify and compare the main quality tools and techniques in regards to what they can do and when they should be used; (1)</p> <p>Explain the seven basic and advanced tools; (1)</p>	<p>Representative video of the seven basic tools. Demand a structured table where one of the columns has the name of the tool and on the other there is its importance and applicability.</p>	<p>Handout</p> <p>White board</p> <p>Video</p> <p>Case study</p>
2 h	<p>Employee Training and Certification</p> <p>The importance of staff certification to assure processes reliability and products acceptable costs</p>	<p>Explain the need of employee training and certification; (1)</p> <p>Check for employee training and certification needs; (2)</p> <p>Relate the need of employee training and certification to</p>	<p>Debate the relation between the product cost and the need of employee training and certification.</p> <p>Discuss which kind of</p>	<p>Handout</p> <p>White board</p>

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		assure processes reliability and products acceptable costs; (3)	training should be required and how it should be imposed in the staff.	
2 h	<p>Company Quality Management System and Certification</p> <p>In-company and externally audited quality systems (ISO 9000).</p> <p>Certification of the:</p> <ul style="list-style-type: none"> <li>- Company</li> <li>- Manufacturing site</li> <li>- Production line</li> </ul> <p>Need to be a certified manufacturer.</p> <p>Legal requirements for some products (EU directives).</p> <p>The need and the procedures for some manufacturing processes to be externally assessed and certified.</p>	<p>Name the required documentation to guarantee a proper quality management system and certification of the different parties, products or processes; (1)</p> <p>Explain the need of being a certified manufacturer; (1)</p> <p>Interpret the legal requirements for some products; (2)</p> <p>Check the certification of the company, manufacturing site and production line; (2)</p> <p>Check the legal requirements for some products; (3)</p>	<p>Discuss how a quality system described in ISO 9000 can be applied in a given situation.</p> <p>Ask the students to list which departments/steps/people should be certified.</p> <p>Debate the importance and need for external certification of processes and personnel.</p>	<p>Handout</p> <p>White board</p> <p>Part of ISO 9000 adequate for this chapter</p>

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