Structuring and preparation of a lesson: **EAE module 8 (Quality management)**

time	Theme, core information, statements or questions	Learning objectives [1]	Methods (e.g. presentation/ discussion/group work)	Media/ training material
1 h	Introduction the adhesive bonding process Adhesive bonding considered as a special process in ISO 9000. <u>Adhesive joint quality assurance and reliability:</u> - Can't be guaranteed - There are no suitable non-destructive; examination methods. <u>Inspection of adhesive bonds:</u> - Not feasible to assure quality; - Unnecessary activity in a well-controlled process. Assurance secured by systematic management and control of the whole operation from joint design to final assembly. Poor quality joints are reduced to a minimum when proven procedures are followed at all times.	Explain the importance of having a quality management system and control for adhesive bonding processes; (1) Explain why adhesive bonding is considered to be a special process, according to ISO 9000; (1) Discuss how the possibility of poor quality joints is reduced to a minimum when proven procedures are followed at all times; (2) Analyse the use of specific procedures for quality management and control of the whole operation; (3)	Introduce the ISO 9000 so the student realizes where can he get the information 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.	Handout White board Part of ISO 9000 adequate for this chapter
4 h	Raw Materials Control <u>Supplier certification</u>	Explain how to correctly store all materials in the bonding process, making reference to all control	In small groups or individually, require a table with the main	Handout

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	- Status of all suppliers of any materials in the bonding process (adherents, consumables, adhesive, fixed equipment). <u>Manufacturing system qualifications</u> <u>Incoming specifications</u> - Defined by the final costumer or manufacturer <u>Testing</u> - Required on any incoming materials, to prove compliance with the incoming specifications. - Test adequate to the process (e.g. viscosity, lap shear strength) or according to a specification and supplier's quality system. Correct storage of all materials in the bonding process, e.g. control of temperature, humidity, airborne dust, shelf life.	parameters which should be considered; (1) Control aspects regarding raw materials, such as supplier certification, manufacturing system qualification, incoming specifications and testing; (2)	topics that are involved in material control. Debate what should be included in each of the previously proposed topics. Simple exercise where the students will have to select the best way to store	White board Exercise/example of material storage
8 h	Process <u>Procedure specifications:</u> - Documentation of all the process steps (adhesive storage and application, surface treatment, assembly, cure). - Bonding coordination should be considered here and in Module 5 (Bonding Process). It is equivalent to the Welding Coordination of EN 719. <u>Staff training:</u>	Explain the importance of documenting all process steps; (1) Control aspects regarding the process, such as procedure specifications, staff training and statistical monitoring methods; (2) Promote the use of feedback and problem solving in	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	Handout White board Case study

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	- Documentation of skills, staff experience, and training required to achieve product reliability and to comply with the company's quality system. <u>Statistical monitoring methods:</u> - 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. - Methods of feedback and problem solving.	monitoring methods; (3) Compare staff qualifications to the ones required to achieve product reliability and to comply with the company's quality system; (3) Monitor process control continuous process; (3)	the missing elements. Debate about how to correlate and complete the company's quality system through training of staff. Case studies with the aim to present the statistical monitoring methods. These case studies should be given by the professor or by a student with a relevant experience that can be applied to the topic.	
8 h	End-product Control <u>Visual Inspection</u> - Simple approach to verify if the process is correct, e.g. joint appearance, alignment, visible excess adhesive.	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,	Distribute the class in the 6 groups with correspondence to the main themes of the class. With the support of the professor each group	Handout White board Presentations of students

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	<u>Physical Inspection</u> - Measurement of a useful feature to verify if the product was correctly made. <u>Non-destructive Tests (NDT)</u> - NDT available to detect flaws or failed products, e.g. ultrasonic C-scan, electrical measurement, gas leak test. <u>Destructive Tests</u> - Parallel test pieces (witness samples) to be used for destructive testing. Tear-down of a complete product, with an agreed frequency or in the event of a dispute. <u>Sampling and Statistics</u> - Procedures for samples. - Frequency and cost of sampling to ensure process capability. - Statistical techniques. <u>Limitations of end-product control</u> - After the joint has been made.	sampling and statistics and its limitations; (1) Apply appropriate methods for end-product control; (2) Monitor end-product control process; (3)	has to develop a presentation of the theme, which should include: - Explanation of this kind of control/inspection/test - Explanation of its application in adhesive bonds. - Highlight the advantages and disadvantages of each end-product control comparing with the others. - Exposition of interactive examples, i.e., the groups should give an example where the	

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			theme has to be applied, explain why it is applied and how. These exercise should involve the participation of the other students and work as a conclusion of the theme.	
4 h	Available Quality Tools and Techniques Overview of the main quality tools and techniques, what they can do and when they should be used. Presentation of the seven basic tools and after advanced tools, e.g. QFD, Taguch, FMEA, Ishikawa diagrams, Pola-yoke.	Identify and compare the main quality tools and techniques in regards to what they can do and when they should be used; (1) Explain the seven basic and advanced tools; (1)	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. Apply the tools (basic and advanced) to a case study provided by the professor or	Handout White board Video Case study

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			the student.	
2 h	Employee Training and Certification The importance of staff certification to assure processes reliability and products acceptable costs	Explain the need of employee training and certification; (1) Check for employee training and certification needs; (2) Relate the need of employee training and certification to assure processes reliability and products acceptable costs; (3)	Debate the relation between the product cost and the need of employee training and certification. Discuss which kind of training should be required and how it should be imposed in the staff.	Handout White board
2 h	Company Quality Management System and Certification In-company and externally audited quality systems (ISO 9000). Certification of the: - Company - Manufacturing site - Production line Need to be a certified manufacturer. Legal requirements for some products (EU directives).	Name the required documentation to guarantee a proper quality management system and certification of the different parties, products or processes; (1) Explain the need of being a certified manufacturer; (1) Interpret the legal requirements for some products; (2)	Discuss how a quality system described in ISO 9000 can be applied in a given situation. Ask the students to list which departments/steps/people should be certified. Debate the importance and need for external	Handout White board Part of ISO 9000 adequate for this chapter

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	The need and the procedures for some manufacturing processes to be externally assessed and certified.	Check the certification of the company, manufacturing site and production line; (2) Check the legal requirements for some products; (3)	certification of processes and personnel.	

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