MODULE B – INDUSTRIAL PRACTICE AT ITS BEST

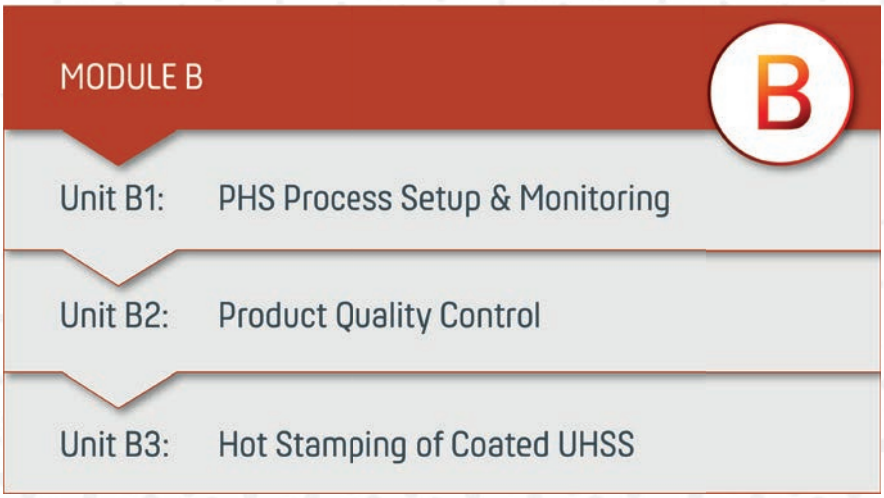
If it comes to practical procedures on shop-floor level, quality of PHS components can only be maintained if highly specific procedures are fully understood, and, consequently applied.

"The real sport in PHS processing is it to keep an eye on everything – at any time! Finally it's a question of skill and training."

Agim Ademaj, PHS Trainer

The **Intensive Training in Press Hardening Module B** therefore puts special emphasis on aspects e.g.:

- selection of process parameters for different PHS material systems
- process control
- temperature profiling & process monitoring
- materials testing equipment & procedures
- part quality & failure
- reliability and productivity of PHS processes.



Line-up of learning units of Intensive Training in Press Hardening Module B

Target Audience

The Intensive Training Module B is meant to improve the individual skills of engineers, technicians, and foremen in the fields of production and quality assurance, as well as maintenance and production planning. At the same time, it serves as sensitization for typical PHS audits.

Program

As indicated in Figure 3, the training contents are divided into 3 topical units.

Unit B1: *PHS Process Monitoring*

Contents. This training addresses the selection of appropriate process parameters and through-process control in industrial hot stamping. All relevant process parameters and variants to be included in a monitoring strategy will be revealed. Their effect on the product quality will be explained. Appropriate and specific detection methods will be practiced. The following questions will be answered:

- ❖ What should be measured?
- ❖ Where should measurements be carried out?
- ❖ How should measurements be carried out?
- ❖ Why is the measurement necessary?

Aims & Targets. Participants will receive a complete overview of all relevant PHS process parameters. Appropriate measurement methods will be explained, and their application, including the evaluation of measurement results, will be exercised. Participants' attention will be particularly focused on the accuracy of measurements. The necessary balance with the achieved component properties will be generated.

Unit B2: *Product Quality Control*

Contents. When producing UHSS components using industrial hot stamping, the most important product properties, e. g., surface topography, mechanical properties, and electrical properties, are adjusted within the manufacturing process itself. Therefore, sufficient knowledge and skills concerning the choice and application of appropriate testing methods will be trained. Analyses and evaluations of the relevant material properties of uncoated and coated PHS will be considered. Special attention will be focused upon the following procedures:

- ❖ Mechanical testing (tensile test, hardness measurement)
- ❖ Non-destructive testing
- ❖ Metallography and microscopy
- ❖ Surface analysis
- ❖ Electric resistance.

Aims & Targets. The participants will receive specific knowledge concerning the characteristics of PHS components. They will be trained to make proper selections of testing equipment and procedures in regards of the mechanical properties, surface layer consistency, surface topography and electrical properties, particularly those of PHS with various metallic coatings. They will be able to perform the characterization and evaluation of thermo-mechanically induced modifications of properties from the initial state of the blank material to the final PHS component.

Unit B3: *Hot Stamping of Coated UHSS*

Contents. The specific behavior of various metallic coatings on steel substrates under characteristic thermo-mechanical loading situations relevant for industrial hot stamping will be explained. In addition to the standard AlSi-coating material applied in direct press hardening, the focus of this training will concentrate on the particularities of different zinc coating variants (ZnNi, GI, GA) available for direct and indirect press hardening. Time-temperature profiles and characteristic layer properties will be addressed in the same way as induced failure mechanisms.

Aims & Targets. Participants will develop a thorough understanding of the specific behavior of different metallic coatings under typical thermo-mechanical loading situations in press hardening. They will be able to define corresponding process parameters and related process windows. They will develop a sufficient understanding of the relationship between the selected process parameters and the resulting material properties. The through-process layer consistency, micro structure, surface topography, oxide formation, electrical resistivity, thermal conductivity etc. will be explained extensively. The participants will receive sufficient knowledge regarding the analysis of the coating properties and their evaluation, particularly with respect to quality and failure.

Schedule Module B

The workshop consists of a concentrated and specific knowledge transfer in form of seminars combined with field exercises. It takes place either on site at the customer's plant using selected materials, and locally available facilities or at the METAKUS PHS Training Center in Germany. The training encompasses a total of three full days of seminars and field training according to the schedule shown in Figure left.

Schedule	1st Day	2nd Day	3rd Day
AM	Unit B1 Seminar	Unit B2 Seminar	Unit B3 Seminar
		Unit B2 Case Study	Unit B3 Case Study
Noon	Lunch break	Lunch break	Lunch break
PM	Unit B1 Field Exercise	Unit B2 Case Study	Unit B3 Case Study
			Unit B3 Presentation Case Studies

Three-day schedule of Intensive Training Module B.

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