Abstract
Applying QuinLogic’s rule-based Quality Execution System in the manufacturing process of Press Hardening Steel brings huge benefits through optimization of the production process while at the same time assuring highest quality standards.

Introduction
Hot sheet metal forming has become the state-of-the-art technology in manufacturing components with challenging properties for the automotive industry. Providing parts with highest geometrical complexity and ultra-high strength requires profound process know-how in order to comply with ever increasing customer requirements regarding safety and weight. Changing material properties applying heat, hot stamper in contrast to the cold metal forming industry are confronted with a responsibility shift from supplier to manufacturer that makes quality assurance an important success factor.

QuinLogic offers a fully integrated Quality Execution System (QES) which is well established in the steel and aluminum production industry, especially with mills that focus on the automotive sector. QuinLogic has recently entered the manufacturing industry by releasing a PHS Edition of its QES. This unique production quality management software package allows 24/7 monitoring of the hot stamping process and product quality data. As a ready-to-use software product with quick installation time and low maintenance effort, benefits are realized shortly after project start.

Three Benefits at a Glance
- Gaining customer trust with established quality system
- Increasing production efficiency, lower cycle times
- Avoiding repeating issues with root-cause analysis

Rule-Based Quality Assurance
Assuring that product and process quality is according to specification is one of the main features of the QES. It is implemented as a set of data integrating and rule-engine based software modules. Focusing on user-friendliness while still implementing advanced features is key for quick adaption. This is one of the main reasons for the success of the wide-spread QES. The system allows a multitude of quality criteria to be specified, managed and changed within no time. Having all relevant quality data on one screen directly at the production line gives quality managers and operators the leap ahead for instant feedback on up-building issues and allows quick reaction times to correct any unexpected problems.

Quality Execution System - “PHS Edition”
The PHS Edition of QuinLogic’s QES is a package of software modules tailored for the hot metal forming industry. All quality relevant process and product data collected from gauges, presses, thermal cameras, business systems is connected, structured and prepared with the DataIntegrationStudio, making data handling within the QES world quick and easy.

Fig. 1: Rule Management with LogicDesigner

The LogicDesigner (Fig.: 1) is the core part of the QES. It is an easy-use rule management tool, which allows the creation, modification and management of basic as well as advanced rule sets. By applying simple drag-and-drop, engineers and operators without programming skills can edit rules in everyday use without involvement of the IT department. Since all data is connected to the system, production data is put into context (customer specifications, material grade). Through simulation of rule sets on archived data, their performance can be evaluated before they are activated. For advanced programmers, scripting is supported, so that highly sophisticated rules with any level of complexity can be implemented.

Fig. 2: Reviewing with Quality Monitor
Background services employ these rule sets to constantly check production data against specifications. Long-term analysis, individual review of critical products is done using the QualityMonitor (Fig. 2) which is a highly customizable visualization and decision supporting program.

The very recent quality trend and production performance is displayed on the Live Process Quality Monitor (Fig. 3), ideally running at large screens directly at the press line. It displays all process and product relevant quality data (e.g. oven temperature, time-from-oven-to-press, total tonnage) of the recently produced parts and their type specific, respectively customer specific limits (“data-in-context”).

Live production results can also be displayed in the quality laboratory where lab-testing is performed, so that samples from specific dies can be requested. Testing data from the laboratory is stored within the system’s database through the intuitive LabReports tool (Fig. 4). Later it can be used for statistical analysis using the LogicDesigner rule management tool, allowing a steep learning curve on the hot metal forming process.

Additionally, WebReporting & Analysis, a web-based tool to access shift, day, month and year reports as well as long-term quality analysis on any device that features a web browser, including tablets, phones, notebooks and desktop computers, is included in the package.

Features and Benefits
The QES is a ready-to-use customizable software product. No project specific development is necessary, guaranteeing short installation times and a quick return-on-investment.

Automatically generated quality reports, product certificates and shift reports give manufacturers a solid discussion basis for negotiations as well as faster product development and certification. Using a proven quality assurance solution helps gaining customer trust, a key factor in long term business relationships.

Laboratory testing data is fully integrated into the workflow. A better understanding of quality data and their correlation improve the process know-how and assure consistent and reproducible product quality. This is in particular a challenge, as steel is transformed from simple geometries like strip or bars into complex components as the result of the hot press forming.

Having all quality data on one screen, there is no need for engineers to crawl through databases to find the information they are looking for. Easy access to all process and product quality data allows significantly faster product development as well as reduction of cycle time leading to more efficient production.

Prepare for the future requirements of your industry applying the QES - PHS Edition. Contact QuinLogic’s technical sales staff for information on pricing, press articles and customer reference information.

Outlook
ProactiveProcessSupervision & ExpertShell, a tool visualizing the production process as a fully-featured 3D model flagging production inconsistencies, material flow tied in with a knowledge conserving and improvement mechanism (“advice-feedback-cycle”), giving expert advice at the line where and when it is needed is soon taking the process monitoring and know-how management of hot metal forming to the next level!