

DRAFT FOR STAMPING JOURNAL

R&D and Applications – Training Course in Servo Presses and Servo Hydraulic Cushions
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In the transportation industry, the need for light weight structures and safety requirements can be met with innovations in developing new materials, machines, tooling and new forming methods. Lightweighting is achieved by product design, materials, processes, lubricants and production equipment as well as other factors that influence the design and production of transportation vehicles, Figure 1. These include: safety and pollution related regulations, mileage requirements, perceptions and preferences of the customer, profit requirements and very importantly the overall COST of the vehicle.

Manufacturers apply the results of effective R&D to improve product performance and quality, in addition to reducing costs and lead times. These improvements are expected to improve global competitiveness. At least, this is the accepted paradigm, i.e. conduct relevant R&D and apply the results to production.

It is widely accepted that increased R&D and investment contribute to increase in productivity and competitiveness. However, it also necessary to consider how the training and knowledge base of the people, who design and manufacture a product, contributes to the competitiveness. Often, in discussing competitiveness, the labor rates in various developing countries, mainly in Mexico and China, are compared with those in the U.S. However, often labor productivity is not emphasized.

Importance of Training

It is useful to remember that stamping companies around the world pay approximately the same to purchase similar hardware, i.e. presses, automation, energy, materials, etc. The main difference that affects production costs is (a) the use rate (uptime) of the presses, and (b) the scrap rate in the plant, i.e. how much material is purchased and how much stamped product is shipped. The company that runs their presses at a high utilization rate certainly has an advantage in reducing production costs.

Thus, a progressive maintenance program and a motivated maintenance crew, for example, as discussed in earlier Stamping Journal article, makes a major difference in maintaining a large equipment up time [1]. Overall, the training of the work force, even though the labor costs differ considerably between Mexico and U.S. for example, affect considerably the share of the labor cost in producing stampings. As a German executive recently pointed out to the author, stamping is an investment intensive industry, and stamping companies, around the world:

- Purchase similar equipment (presses, automation, robotics, etc.) from the same machine builders
- Purchase materials from rather the same material suppliers
- Borrow money pretty much at similar rates

Thus, the main factor affecting competitiveness in stamping may be labor rates and labor productivity in different countries. For example, in Mexico labor rates may be 1/5th to 1/3rd of those in U.S. However, it is useful to consider:

- a) What is the percent of labor cost, as part of the total cost of a stamped part

- b) What is the utilization rate / or Up Time of equipment, which may be the largest factor in affecting the part cost

The selection of production equipment, when older equipment is replaced or capacity increased, the equipment up time, the scrap rate, the try-out time and cost are greatly affected by the training and knowledge level of the personnel, including researchers, engineers, tool and die makers, maintenance team and press operators.

Thus, training and improvement of skills are some of the best avenues to improve competitiveness. This is well-known but how to achieve it, is not always straight forward. A recent article in Wall Street Journal [2], argued that in globalization and so-called “unfair trade practices”, often the level of training is the major factor. The article states “the success of Germany, which forces competition from developing countries, shows that well trained workers can thrive amid pressure from abroad. About 75% of Germany’s private-economy workforce has taken part in the country’s system of vocational training with apprenticeships”. While the U.S. does not have a nation-wide apprenticeship system, many companies have apprenticeship and/or internship programs that assist the workforce in increasing their knowledge base and skills.

Training Course on Servo Presses and Servo Hydraulic Cushions

In stamping industry, as in other manufacturing industries, training is very significant. Furthermore, a major trend in stamping is to use, whenever economically justifiable, servo drive presses and servo hydraulic cushions. With this consideration in mind, Hyson Metal Forming Solutions, Shiloh Industries, and the Center for Precision Forming (CPF) of The Ohio State University organized a training course on “Fundamentals and Applications of Servo Presses and Servo Hydraulic Cushions”. The agenda of the course is given in Figure 2.

The course included welcome by Hyson and Shiloh representatives and introductions by two well-known faculty members, who are involved in research and teaching, related to sheet metal forming technologies. The actual course included (a) short introduction to stamping operations, (b) the sheet metal forming system, including the significance of material properties, (c) die design and materials, and (d) lubrication and friction.

A significant portion of this course was devoted to hydraulic and mechanical presses (components, kinematics, force and energy relationships, ram speed and strokes per minute –SPM). Finally, a major part of the course covered servo presses (kinematics, advantages, variation of ram speed during the forming stroke, comparison with mechanical presses) and servo hydraulic cushions (advantages in controlling Blank Holder Force (BHF) during stroke, capability to avoid hard hits). Case studies, obtained from various publications and from CPF research, to form complex parts in servo presses, were reviewed.

The live demonstration at the Hyson Metal Forming Center, illustrated how to form an experimental part from AI 5182-0, using the capabilities of the servo press and servo hydraulic cushion, Figure 3. A panel, consisting of experts from OEM’s, first tier suppliers, a lubrication company and suppliers of a servo press and a servo hydraulic cushion, was instrumental in conducting a lively Question and Answer session, with strong participating by the audience. The course was attended by nearly 60 people, representing a full house.

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References:

1. Kate Bachman, "Xtreme MRO keeps heavy weight stamper on track", *Stamping Journal*, Nov/Dec, 2016, p. 14
2. E.P. Lazear and S. Janssen "Germany Offers a Model for Middle-Class Jobs", *Wall Street Journal*, Sept. 12, 2016

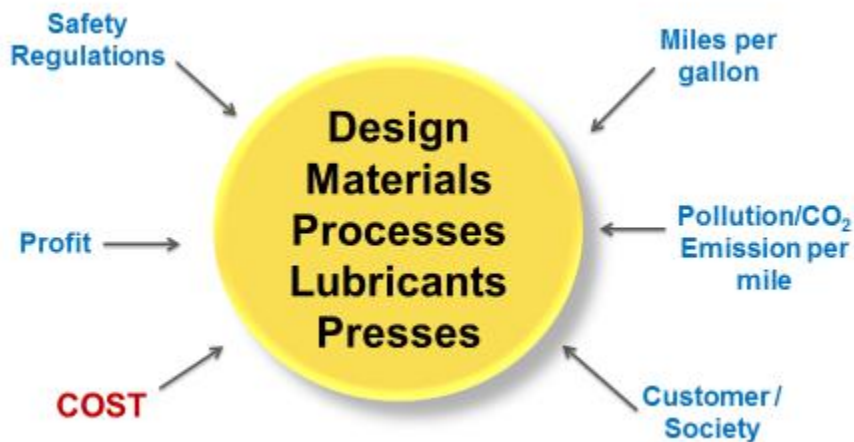


Figure 1: Major Factors that Affect Automotive Stamping

Fundamentals and Applications of Servo Drive Presses and Servo Hydraulic Cushion – a Training Course

- 8:30-8:45 – Welcome – Hyson, Shiloh
- 8:45-9:00 – Prof. Fadi Abu-Farha, Clemson University
- 9:00-9:45 – Prof. Sergey Golovashchenko, Oakland University
- 9:45-10:00 – Coffee Break
- 10:00-10:30 – Prof. Taylan Altan, Center for Precision Forming – CPF (Introduction/Material Properties/Lubrication) -
- 10:30-11:00 – Hydraulic and Mechanical Presses
- 11:00-12:00 – Servo Presses and Servo Hydraulic Cushions
- 12:00-12:30 - Applications
- 12:30-1:30 – Lunch
- 1:30-2:30 – Demonstration – Hyson Metal Forming Center
- 2:30-3:30 – Panel Discussion / with representatives of Aida, Shiloh, FCA, IRMCO, Hyson, Honda, CPF
- 3:30-4:30 – General Discussion
- 4:30 – Adjournment

Figure 2: The Agenda of the Training Course on Servo Presses and Servo Hydraulic Cushions, held at Hyson Metal Forming Center, on May 3, 2017.

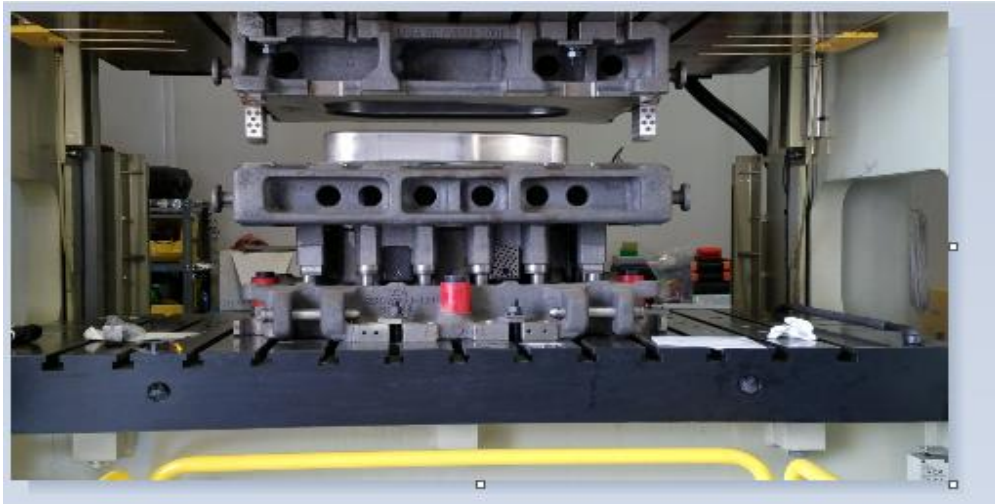


Figure 3a



Figure 3b

Figure 3: The demonstration session, using the 300 ton Servo Press and the 100 ton servo hydraulic cushion, was held at the Hyson Metal Forming Center. a) die set provided by Honda and the formed part in the press, b) the part from Al 5182-0 formed during the laboratory demonstration (part size about 900 mm x 600 mm)