Table of Contents

6 Environmental Activities in the Industrial Machinery Business

Komatsu is the world's leading maker of large-scale presses, supplying sheet-metal presses and machine tools for use in automotive manufacturing and various other industries around the globe. In the area of industrial machinery, we are taking a proactive stance with regard to our mission of conserving the environment, based on three key phrases: "saving energy," "saving resources," and "reducing noise and vibration."

Overview of Industrial Machinery Operations

The area of industrial machinery, represented by presses and machine tools, plays a critical role in the manufacturing of automobiles, household appliances, and various other manufactured goods that are indispensable to our everyday lives.

Automakers and other major industrial corporations worldwide rely on our expertise in the design and manufacture of sheet-metal presses and machine tools. For sheet-metal presses, we provide high-precision products through the application of fine-plasma technology and various other systems. The integration of advanced control technologies and robotics results in greater productivity and quality. Komatsu is now working to supply our customers with the products they need more promptly than ever. Moreover, we are expanding our engineering business overseas by drawing on the comprehensive resources of companies within the Komatsu Group umbrella.

Environmental Conservation in Industrial Machinery

Komatsu is also motivating group-wide, global environmental activities with regard to industrial machinery. Specifically, we are conducting research and development with the goal of harmonizing product features with our basic policy as defined by the following three key phrases:

1. Saving energy
2. Saving resources
3. Reducing noise and vibration

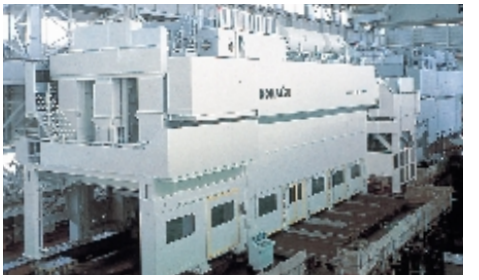
Energy-saving Initiatives

Presses, sheet-metal presses, and machine tools—due to their role as manufacturing machinery—all require a long service life. In fact, many such machines are used for twenty to thirty years. Therefore, in terms of efficiency percentages over the product lifecycle, these machines tend to consume large amounts of energy while in use at the customer's facilities. With large presses, the ratio of energy consumed while in use is estimated to be more than 70 percent of the total energy consumed during the product cycle. Accordingly, we have made it a top priority to develop technologies that will lessen the product's energy consumption during use.

Development of the Modular Transfer Press

Large amounts of pressure are required in order for a press machine to work effectively. To process the material at a high level of precision, the press must have a heavy, movable body with high sliding rigidity. However, the greatest expenditure of energy is devoted to driving this movable body.

Heeding this point, Komatsu developed its modular transfer press in 1997, based on a revolutionary new structure. With this modular transfer press we achieved a 30-percent weight reduction in the movable body, the utilization of regenerative motor energy and dramatic improvements in drive-system efficiency, thereby producing a significant savings in energy consumption.



Modular Transfer Press

Development of the HCP Series Electric Servo Presses

Mechanical presses have traditionally been used in small press applications. A mechanical press employs a transfer mechanism to convert the clutch energy stored in the flywheels into working pressure. However, this type of press is subject to various inefficiencies, since it is difficult to adjust the up/down strokes, force of pressure, pressure timing, and other conditions in accordance with the processing requirements of a particular part.

Electric servo presses, on the other hand, allow these parameters to be set arbitrarily, and can therefore process parts with minimal consumption of energy. To that end, Komatsu developed its HCP series electric servo presses, introducing them to the market in 1998.

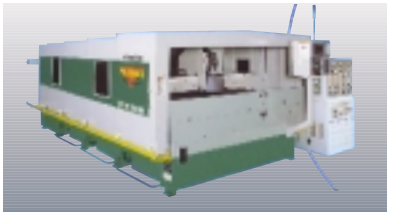
The optimization of speed and accuracy facilitated by the HCP series has dramatically reduced the levels of noise and vibration present during processing, and moreover, has resulted in superior overall performance in terms of energy consumption.

HCP Series Electric Servo Press

Development of the Twister Fine-plasma Cutter

Laser cutting machines are generally used to cut sheet metal in curved shapes. In fiscal 1999, Komatsu developed the Twister fine-plasma cutter featuring superior cutting quality as well as energy-efficiency compared to expensive laser cutting machines.

The higher cutting efficiency of the Twister fine-plasma cutter is achieved through combined use of a newly developed high-output power supply and high-voltage plasma torch. When cutting a mild steel plate 12-mm thick, the Twister's efficiency is approximately 3.5 times that of a laser cutting machine (with output of 3 kW). The new cutter also represents a measure of resource responsibility, in that its consumable plasma-torch nozzle is twice to four times the life of nozzles used in our conventional cutters.



Twister Fine-plasma Cutter

Development of the PAS Series Servo Press Brakes

Since 1995, Komatsu has been promoting the development of electric servos in plate benders, commonly known as press brakes. With a conventional hydraulic servo system, the characteristics of hydraulic circuits have made it difficult to minimize the loss of energy. Our PAS series press brakes, however, dramatically reduce energy consumption through the use of electric servo control, and as such have been very well received by our customers worldwide.

Saving Resources

Large amounts of steel material are required to construct industrial products such as presses and machine tools, since the structure of such machines must be very rigid in order to ensure the required processing accuracy. For example, large transfer presses can sometimes weigh more than 2,000 tons. Therefore, when industrial machinery of this type and scale becomes obsolete due to changes in manufacturing technology, its disposal represents a considerable waste of resources. In addition, if a new machine is to be manufactured, CO_2 will be generated in the process of procuring resources and materials. Therefore, Komatsu now offers a retrofitting service whereby pieces of cutting-edge hardware and software are added to the existing facility in order to give new life to the old machine.

Development of the Retrofitting Service

A press machine is typically used over a period of years. Therefore, it needs regular maintenance and timely repair in order to maximize its service life. However, in recent years a different need has emerged. It is a need to improve facility performance not simply through maintenance and repair but by retrofitting based on the latest technologies.

To transport the work to the next process, for example, transfer presses manufactured more than fifteen years ago employed transfer units based on a cam system, which was then the mainstream approach. In that method, the transfer unit derives power from the drive shaft located in the main press unit. Unfortunately, there were limits to the improvement in productivity possible with the system. What we are now doing is to replace the old drive system of the transfer unit with a cutting-edge electric servo that allows significant enhancements in productivity. Additionally, the control system of the entire press line can be replaced with the latest hardware and software, thereby reducing the time needed for setup, changeover, and maintenance. Consequently, the actual operation rate is improved dramatically.

Retrofitting the aging or technically obsolete components with new technology, as described above, allows the press line to be used continuously without upgrading every single part. This provides significant savings in the use of valuable resources.

Reducing Noise and Vibration

One environmental problem inherent in the use of press machines regards the noise and vibration generated during their operation. At Komatsu, though, we have for some time been involved in an effort to reduce press noise. In the area of compact, general-purpose C-frame presses, following the development of an effective damping technique for laminated sheets, we introduced a low-noise press having a relative noise reduction of 7 dB in fiscal 1991. As for large presses, we developed a low-noise transfer press and began marketing it in Europe during fiscal 1992. With that transfer press, we achieved a noise reduction of 8 to 10 dB relative to our conventional models.

We continued our effort to reduce stamping noise and vibration, and in 1996 developed a breakthrough shock eliminator that can be added to existing presses. Subsequently, in 1998, we developed a multistage-motion, low-noise stamping method using a servo press developed jointly with Komatsu customers. The new press system reduces noise by a maximum of around 10 dB, as compared to conventional models.