

bills, cuts and reconnections. Several major new generating facilities are planned over the next few years.

METAL PRODUCTS

The metalworking industry has been contracting out since 1992 as a result of domestic recession and an inability to meet international quality standards. Many products are still made with conventional machine tools, resulting in unacceptable variations in quality. Revitalization depends heavily on the industry's ability to take advantage of export opportunities stemming from the market changes due to the lower peso.

PETROCHEMICALS

Petróleos Mexicanos (PEMEX) is the national oil company. The government recently passed legislation to privatize *PEMEX's* petrochemical operations. Some of these plants use out-of-date technologies, and therefore the newly-privatized enterprises will be under intense pressure to modernize, especially since they will no longer enjoy guaranteed markets and prices.

PLASTICS

Computer aided design (CAD) and engineering technologies have begun to gain wide acceptance in the plastics industry. Imports of plastics machinery increased by more than 250 percent between 1990 and 1994. Nonetheless, only the largest firms have adopted these technologies. Per capita consumption of plastics is only one-quarter of the level in the United States, so sustained growth is predicted.

PROCESSED FOODS AND BEVERAGES

The beverage industry is an exception to the general finding that computer integrated manufacturing (CIM) has not yet been adopted by Mexican companies. For example, *Fomento Económico Mexicano (FEMSA)*, of which Canada's John Labatt owns 22 percent, has implemented a highly-integrated

automation program. It incorporates planning and forecasting, material resource planning (MRP), quality control and process automation as well as robot-operated storage. Likewise, packaged food producers are beginning to see automated packaging, warehousing and distribution systems as competitive tools.

HOME APPLIANCES

The home appliances industry is a good prospect for automation products. It is about 70 percent foreign-owned and is, therefore, relatively sophisticated. The industry is a major exporter, with shipments going to some 30 countries, and thus it must meet international standards. In addition, the government has recently imposed new product standards based on the norms set by the U.S. Department of Energy. As a result, many manufacturers will have to modernize so as to comply.

COMPETITION

Most of the major international manufacturers of computers and industrial automation equipment are active in Mexico, and the largest of them have Mexican subsidiaries. The biggest computer software producers have local offices, but many companies distribute their products through partnerships with hardware providers or local consulting companies. For example, IBM, Digital Equipment Corporation and several other major computer companies distribute software created by other foreign companies.

Experts involved in the industrial automation industry say that except for ability to pay, access to the latest technology is not a limitation for Mexican industry. However, they invariably comment that the nation lacks people who are skilled and creative enough to integrate the new technologies and develop effective solutions. Systems integration services are presently provided

both by university research centres and private consulting firms.

UNIVERSITY RESEARCH CENTRES

University research centres have played a major role in developing advanced technology applications in Mexican manufacturing. They are both users and developers of advanced technologies and have access to a wide range of equipment and software as well as trained personnel. They are heavily subsidized, which means that they can be very cost-effective in their offerings to the private sector.

National Autonomous University of Mexico

The *Universidad Nacional Autónoma de México (UNAM)*, National Autonomous University of Mexico, is home to the Centre for Technological Innovation (CIT). This is a technological development institution which channels industrial projects to the appropriate departments or faculty within *UNAM*.

UNAM concentrates exclusively on design. Its product is a prototype, which must be manufactured elsewhere if additional units are required. Projects are headed by a project manager, a teacher, a researcher or laboratory staff, and staffed by students.

Technological Institute of Superior Studies of Monterrey

The *Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM)*, Technological Institute of Superior Studies of Monterrey, provides technology consulting services to Mexican companies through the Centre of Integrated Manufacturing Systems. This centre is entirely devoted to solving production automation problems. Its main areas of specialization include design of manufactured products, flexible automation, industrial materials, production engineering and manufacturing systems administration.