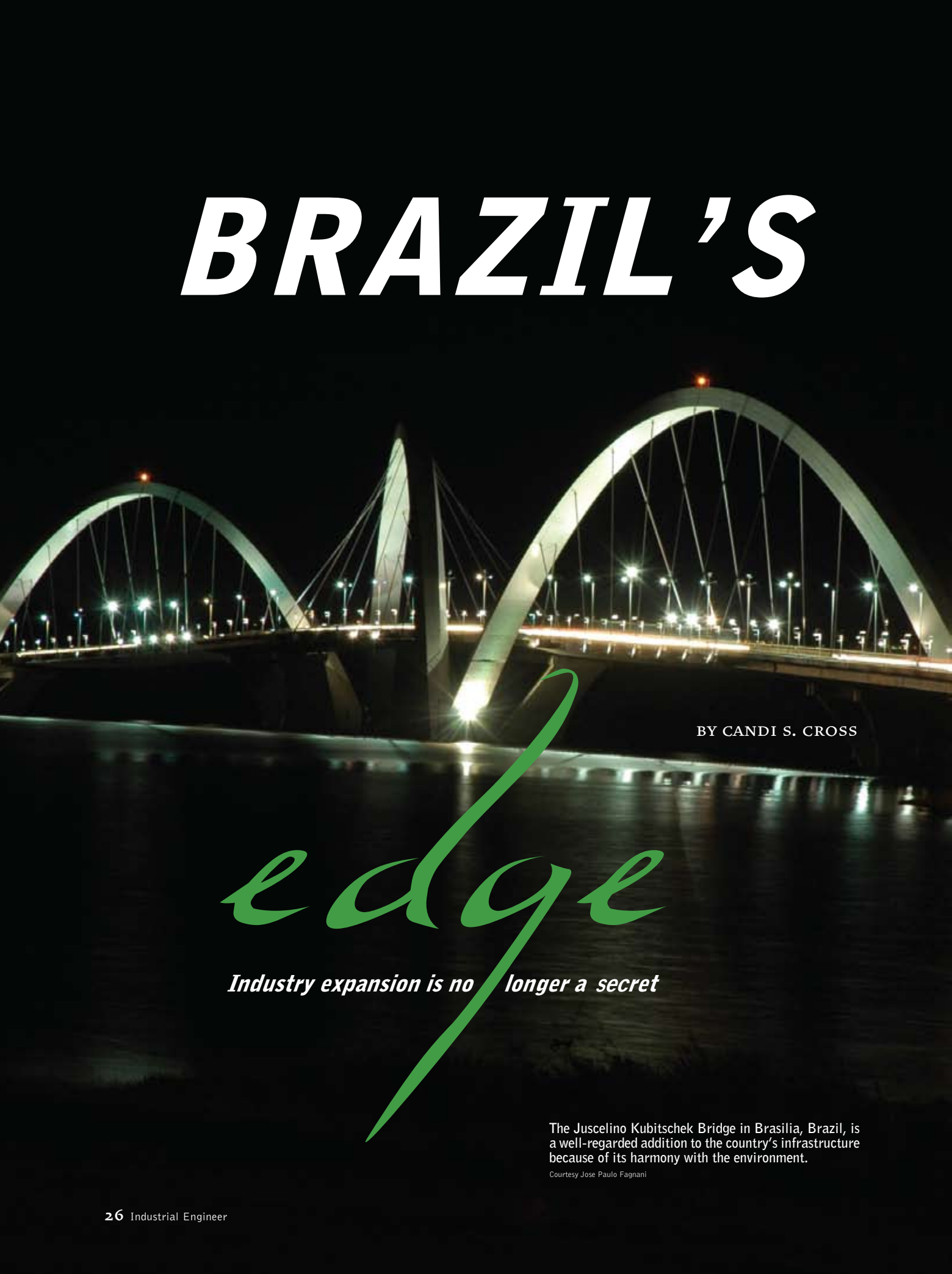
BRAZIL'S edge

BY CANDI S. CROSS

Industry expansion is no longer a secret



The Juscelino Kubitschek Bridge in Brasilia, Brazil, is a well-regarded addition to the country's infrastructure because of its harmony with the environment.

Courtesy Jose Paulo Fagnani

Brazilian Carnival, the world's longest cultural celebration, monopolizes the city of Rio de Janeiro with fashion, food, music and tourism for months at a time while the ebb and flow of business continues to crank in neighboring São Paulo. It doesn't get the publicity, but São Paulo is the center of manufacturing in Brazil and site of the most diversified industrial park of the country. Leather goods are made in the same vicinity with electronics. Also in the region, Campinas holds prestigious universities and many multinational technology companies such as Texas Instruments, Samsung, Lucent and Nortel. Industry in Brazil drew little attention for integrating state-of-the-art technology in plants until Ford Motor Co. developed its Camaçari complex, which is considered to be the crème de la crème of lean automotive manufacturing.

Brazil has been a quiet but steady trendsetter in lean and sustainability for decades. In the mid-1980s, Brazil succeeded in mass-producing biofuel for motor vehicles with alcohol derived from its robust supply of sugar cane. Cars powered by a variety of sources traveled in the majority on Brazil's roads at the time, marking a major but soft-spoken technological achievement.

Assed Haddad, associate professor at Federal University of Rio de Janeiro and IIE member, teaches about the country's roles in automation.

"We are teaching this in our engineering curriculum as well as in several other major areas," said Haddad. "The country has been investing in this subject for some time and as a result of these efforts, some areas of the Brazilian economy are leading the international field with the use of flex fuel (gasoline, ethanol and natural gas) engines in the automobile manufacturing sector with a national fuel system distribution. Several examples can be given, but the oil and gas industry is one field where the country has seen a huge development and a large usage of automated processes either directly in this area or in the supporting activities and suppliers for this field."

Manufacturers are dotting Brazilian countryside because of ease of distribution, surplus of raw materials, energy, land, water resources and almost all other location resource availability, added Haddad, including access to a population of 186 million people. Engineering education, particularly industrial engineering (more commonly known as process engineering in South America), has contributed to the economic development being mobilized by modern manufacturing processes.

Automating the Americas

Smart machines, dynamic optimization and robot precision tools have been integrated with employees in savvy plants for some time. However, more recently, facilities that function with automated processes more than 75 percent of the time characterize a different class of manufacturing. Product quality, profitability, international trade, employee morale and the labor force in general are all affected by the use of automation. And its results must still be measured case by case.

"For automated processes, there is quite a bit of progression being made in general as industries strive to balance labor costs with investment in automation. For some processes, automation is definitely a consideration but oftentimes the benefits need to be balanced with the cost to maintain the automation," said Eric Lussier, director of operational excellence at WHX Corp., which supplies products and services to the electronic, transportation and medical industries from locations in eight countries.

"As an example, one of my past companies developed an automated assembly line to manufacture airbag inflators targeting reducing direct labor costs. Typical assembly lines had 15 direct labor employees and the new line would theoretically be manned with only seven. However, the automation required investing in a higher class of maintenance employees who were familiar with ladder logic in [programmable logic controllers] in order to keep the line running. Thus while some of the direct labor costs were reduced, indirect labor actually increased slightly due to the automation. With that said, it is important to weigh the total cost of ownership in automation including not only direct labor benefits but the potential to have higher indirect costs.

Approximately 700 employees work in the Product Development Center at Ford's Camaçari plant.

"Brazil and Latin America are definitely showing strong growth potential but are still early on in implementation in terms of automation. The attractiveness of Brazil from a Latin America perspective is that it offers one of, if not the largest commercial markets for goods and services."

Ford Motor Co. recognized the attractiveness and opened a $1.9 billion plant in the northeastern Brazilian state of Bahia. One of the most advanced automobile plants in the world, the facility employs more than 20 suppliers directly inside the Ford complex, where the parts are developed, tested and integrated in the main production line. Quality is overseen by the hour. Defects can be monitored and corrected in real time. Complementing dozens of automated processes, the Camaçari plant employs approximately 10,000 workers who have undergone no less than 900 hours of training.

As shown in a video released by *The Detroit News* and narrated by reporter Bryce Hoffman, gigantic robots move in sync from floor to ceiling in designated areas; a flex-system supports five different vehicle platforms at the same time on the same line; seven different suppliers add parts to construct the underbody of each vehicle; and the finished underbody is carried to the main assembly line, where a complete automobile reveals itself.

The video also captures the landscape surrounding the plant, which was once part of the Atlantic Rainforest. Barren from the natural resource clearing that took place years ago, Ford has attempted to restore environmental habitat by composting all food waste from its cafeterias and nourishing soil around the plant.

Another manufacturing sector in Brazil that has benefited from technology is sugar and ethanol. Given that Brazil is the world's top producer and exporter of sugar as well as the second largest ethanol producer, speed and product fulfillment go hand-in-hand. Dedini SA Industrias de Base launched a series of automation technologies to help supply the market. Located in Sao Paulo, the company has developed a revolutionary way to refine sugar directly from cane sucrose through a single crystallization process. According to Dedini, the technology has reduced the cost of each bag of refined sugar by 15 percent. German automation company Proleit AG, which has helped the food and beverage industry automate production, has recently partnered with Dedini, making it the first company in the sector to offer Brazilian sugar and ethanol integrated systems.

Speaking strictly from a business standpoint, IIE member Antonio Motta, who directs the South American regional sales for Texas Instruments Brazil (TI), is not surprised by the country's rise in manufacturing.

"Brazil has a strong potential to become a very attractive market in a couple of years given its large population and its condition of an emerging country," said Motta. "Actually most of the worldwide electronics end-equipment manufacturers have a manufacturing operation in Brazil either by their own sites or through the electronic manufacturing services industries taking advantage of the tax incentives created by the Brazilian government for the companies that assemble their boards locally. In terms of semiconductor industries (either wafer fabs and/or assembly and test facilities), Brazil is not yet at the point to be considered attractive due to some weaknesses in infrastructure (airports, logistics, import/export agility) plus a lack of specialized manpower for microelectronics. However, these conditions are changing and Brazil may become a target for the main semiconductor original equipment manufacturers in the near future to receive investments."

Filling potholes

Whether it's a car, calculator or sugar packets, production runs high, but the movement of goods from Brazil continues to be a challenge. The Associated Press reported last February that the infrastructure of transportation is very deficient in Brazil.

A private port connects to Ford's inventory of automobiles in Camaçari.

GREEN SKIES

Having already created its E-Jets family of narrow-body jets that use less fuel than comparable aircraft, Brazil-based manufacturer Embraer has been busy turning the sky green — at least in the private transport sector. (The actual jets are painted in a vibrant green, too.) The company has established an Environmental Strategies and Technologies Office (ESTO) to focus on eco-friendly policies for its future lines of executive and commercial planes and production practices. The office espouses two strategies: Ensure aircraft efficiency and lower carbon dioxide emissions. The goal is to research and develop materials, technology and practices that reduce aviation's footprint on the environment.

The ESTO will work in conjunction with the manufacturing division to document everyday use of material, for instance. One example of their activities is that every six months all company units must send the environmental data relating to liquid effluents, solid residues, atmospheric emissions, water and electricity and the score corresponding to Embraer's environmental performance evaluation. The scoring criteria of the four groups of the environmental performance index were defined by the company's existing Environmental, Occupational Health, Safety and Quality Integrated Management System.

Embraer's proactive stance on sustainability starts from its internal programs that emphasize everything from managing industrial residue and ensuring that construction projects are environmentally sound to improving air quality with clean air conditioning ducts and reusing wastewater. As for product follow-through, Embraer's ethanol-fueled Ipanema is the first series production aircraft in the world to come out of the factory certified for flying with ethanol.

"The concern over energy issues is the order of the day and the search for alternatives to fossil fuels has taken on a prominent role both in countries' decision-making processes and their public policies in the energy area. Brazil has a great deal to contribute to this discussion," according to the Brazil Embassy in Washington, D.C., in a recent newsletter on energy. "The Brazilian energy mix is one of the cleanest in the world and currently more than 45 percent consumed in Brazil comes from renewable sources, whereas the average share of renewable sources in the energy mix of all developed countries is about 10 percent."

Brazil-based manufacturer Embraer's ethanol-fueled Ipanema

The Ford EcoSport is a best-selling automobile in Brazil, Argentina and Mexico.

"Most roads are old and have poor maintenance; ports are old and operated under obsolete management techniques; railroads are few and uncompetitive. Roads and trucks are the most used method of transportation in Brazil. Despite the existence of several rivers, waterways are very rarely used (the exception is the Amazon region, where rivers are usually the only way of access to many isolated villages). The use of trains for long-distance transportation of passengers is restricted to a few touristic routes (urban trains exist in a few cities), while the cargo transportation ... has not been having much official support."

More than $2 billion has been allocated for infrastructure projects during the next two years. Haddad and Sergio Gouvea da Costa, a professor of operations management at Pontifical Catholic University of Parana, view the infrastructure challenges as a perfect mechanism for industrial engineers to get involved in since they are already being well-schooled in sustainable processes that improve supply chains that Brazil participates in.

"Due to environmental restraints and regulation, this subject [infrastructure] is being highly influential either in the classroom or in industry applications," said Haddad. "The construction industry is also in high demand and the necessary industrialization of its supply chain is merging the construction management field with the industrial engineering knowledge. Communications and electronics are pushing industrial engineering applications in this field also."

Da Costa offers a practical view of Brazil based on its newly stabilized economy. "This new economic reality is promoting conditions to the economic growth and, as a consequence, the income level has risen. Brazil has a big population nowadays enjoying being able to buy more advanced and updated products. The Brazilian industry is a mixture of a young one and a mature one. On the one hand, there are a big number of new investments being made in the country. On the other hand, the installed industry is consistent, that is, the supply chain is comprehensive. The strategic position of the country is important."

All Brazilian industrial engineering schools have courses dealing with sustainability and associations that oversee the curriculum, Da Costa said. For example, the Brazilian Association of Industrial Engineering (ABEPRO or Associação Brasileira de Engenharia de Produção) has divided the industrial engineering field into 10 areas including sustainability. "ABEPRO influences the schools very much," said Da Costa. "It promotes a meeting twice a year involving all IE course coordinators when the IE curriculums are discussed and general policies are proposed.

"Another example might be the Global Forum Latin America. Last June, the Federation of the Industries of the State of Parana – where I live – organized the Global Forum: Businesses, Universities, and Society in a Sustainable World, and the universities were active in the organization and program."

Popular courses in Da Costa's program include Clean Production, Waste Reduction, Recycling, Environmental Licensing, Environmentally Friendly Technologies, Reverse Logistics, Corporate Social Responsibility and Application of International Standards (ISO 14001, 18001).

As for the surge in automation, both professors attribute the integration to the insatiable need for lean across industry. "Lean manufacturing is widely applied in this country. It is taught in all IE schools," said Da Costa. "Besides the more common implementations – kanban, continuous improvement, value stream mapping – more recent tools like lean product development and integration of lean and enterprise resource planning are being implemented."

On the Web

AUTOMATED FORD

At a largely automated manufacturing plant, what are 10,000 employees to do for eight hours every day? Ford Motor Co.'s Camaçari automotive complex makes use of workers and robots, side by side.
www.iienet.org/magazine/nov08/automation