D R. T O M O R R O W ™

FRANK OGDEN

LESSONS FROM THE FUTURE TM

BUILDINGS BUILT -- WHILE YOU WAIT
BY ROBOTS

****

The arrival of robots and automation on the factory floor 20 years ago signalled the decline of union power. Then computers marched into the office and increased the productivity of remaining office workers. Now coming is the most dramatically efficient change yet -- office buildings, apartments and hotels built by a non-stop robot building machine.

Ohbayashi Corporation, a leading Japanese leading construction company, introduced early in 1990 the world's first virtually unmanned automatic construction machine.

Robots have been used in the Japanese construction industry for some time but only in the single job/single robot concept. Ohbayashi's revolutionary concept involves robotization of the entire construction system. Known as the Fully Automatic Building Construction System (FABCS) it is protected under six patents.

All components are factory-produced to precise specifications: pillars, beams, external wall panels, internal partitions, ceilings, floor slabs and other units. Components are stored in a warehouse near the assembly site or underneath the robot machine. Inside the warehouse, self-propelled stacker cranes convey components horizontally or verticially to position. As assembly progresses, pre-programmed cranes retrieve the right parts at the right time and stack them on conveyor cars.

The heart of the system is the Super Construction Floor (SCF), an automated factory with walls and a roof. Identical numbers of pillars are located at the exact spot and angle as called for in the building design. Each pillar contains a hydraulic cylinder, which supports the SCF and lifts it up to the next level when one floor has been completed.

Inside the SCF, overhead cranes cover the entire floor. Each crane has its own complement of robots: assembly robots, welding robots, inspection robots, exterior panel installation robots, interior component placement robots, etc. Both robots and cranes are computer-controlled from the control room on top of the SCF, which assures precision and accuracy in placement and assembly. Self-propelled conveyor cars and elevators carry components and materials automatically to the assembly site.

When the SCF starts first floor assembly, hydraulic cylinders on its pillars are extended so the SCF stands one story off the ground. When pillars transported by crane to the assembly point arrive all the original pillars retract individually into the SCF, making room for the new pillar. The pillar is then welded to the base by the

welding robot.

When all pillars are in place and attached, beams, floor slabs, wall panels, interior material, etc. are automatically added by the overhead cranes and their associated robots. Once the floor is complete the hydraulic cylinders are extended, raising the SCF up one more floor. The process is repeated until the building is completed.

The advantages of this system? Completely unmanned, the FABCS is not subject to labor shortages or disruptions. Dangerous work is done by the robots, so on-site safety is enhanced with no workmen's compensation premiums or claims necessary. Limited temporary structures and scaffolding are required. Site noise pollution is minimal. Operations are not affected by adverse weather conditions. Seven day 24-hour, nonstop operations result in rapid completion and lower financing costs. With prefabricated components and materials, increased precision and quality is possible. Design, estimates and execution are done through the same CAD/CAM (Computer Aided Design and Computer Aided Manufacturing) system. It is expected that the fabrication of all such components will create many, new small industries.

Ohbayashi points out that each building must be designed with automatic building in mind. Each floor must be the same size, but varying interiors are possible. Most economical are high-rise buildings that require repeated executions of the same procedures. Thus, high-rise residential buildings, office buildings and hotels are the most appropriate uses at this time.

Ohbayashi considers the FABCS just the beginning. Continuing research and development of automated systems are essential to the medium and long-term future of the construction industry. Long-range plans include super-high-rise buildings and eventually construction of a lunar city. This company is thinking ahead.

More information: Hiroshi Teraoku, General Manager, Space Project Office, Ohbayashi Corporation, 3,2-chome, Kanda Tsukasa-cho, Chiyoda-ku, Tokyo, Japan.
Phone: (03) 292-1111.
Telex: (222) 4091.

WHERE THE ROBOTS ARE

	1981	1985	1988
JAPAN	21,000	93,000	176,000
U.S.	6,000	20,000	32,600
W.GERMANY	2,300	8,800	17,700
ITALY	450	4,000	8,300
FRANCE	790	4,150	8,300
BRITAIN	713	3,208	5,034
SWEDEN	1,125	2,046	3,042

SOURCE: INTL FEDERATION OF ROBOTICS