Session Report:

INNOVATIVE TECHNOLOGY AND R&D I

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Development of Superconducting Maglev in Japan
by Dr. Fuminao Okumura

Site Information System in Japan
by Mr. Toshimitsu Muramatsu

300 mm Semiconductor Facility Design and Construction Issues
by Dr. Allan D. Chasey

Dr. Fuminao Okumura

Mr. Toshimitsu Muramatsu

Dr. Allan D. Chasey

1. Overview

This report highlights the main points presented and discussed in the first of the twin sessions titled "Innovative Technologies and R&D." Three papers presented at this session are as follows:

"Development of Superconducting Maglev in Japan," authored by Dr. Fuminao Okumura from Railway Technical Research Institute, Japan;

"Site Information System in Japan," by Mr. Toshimitsu Muramatsu from Advanced Construction Technology Center, Japan; and

"300 mm Semiconductor Facility Design and Construction Issues," by Dr. Allan D. Chasey from Arizona State University, U.S.A..

R&D is most productive when it is driven by clearly defined objectives, necessity or problems to be resolved. This is an inherent nature of the technology the role of which is to devise appropriate means to overcome "problems." And technologies in infrastructure construction are no exceptions. Indeed, necessity is the mother of invention. All three papers presented in this session are excellent with this regard in that they present clear discussions about the background that motivated respective R&D activities. Dr. Okumura's paper clearly articulated the required characteristics of the new high-speed rail technology that made Japanese authorities decide JR Mglev as the chosen technology. Mr. Matsumura argues that the establishment of a universal platform is a natural next step in the history of the application of information technology in construction arena, which led to the development of site information system in Japan. Necessity for invention often comes from most unexpected direction. Dr. Chasey's enlightening paper discusses various challenges a new development in the semiconductor manufacturing industry is posing to the construction industry.

2. Highlights of the Presentations

Development Of The Super conducting Maglev In Japan

After the introduction of Tokaido Shinkansen in 1964, travel time between Osaka and Tokyo was drastically reduced to 2.5 hours. Due to the ever growing economy, however, demand for even faster transport continued to grow in Japan. Since then, R&D has been conducted with a new target of developing a new super-speed railway that enables traveling between Tokyo and Osaka in one hour. The required speed of 500 km/hr is not possible if conventional technology was used. It was decided to develop a new system (i.e., JR magalev) based on super conducting magnet and linear motor technology. The author described the principle of Maglev and the detailed studies conducted by the study team sponsored by MOT. The latest evaluation of the test results revealed that JR Maglev is technically feasible for commercial use with the capability of 550 km/h travel speed. To conduct further studies on cost reduction, reliability enhancement and aerodynamic

characteristics improvement, Maglev committee decided to extend the study period by 5 years in March 2000. Chuo Shinkansen appears to be the most promising candidate as the first JR Maglev line given its potential for providing a safe alternative route in the event of a natural disaster that might paralyze Tokaido Shinkansen. The author is optimistic with the future of JR Maglev, a genuine Japanese technology.

Site Information System in Japan

Author explained how the information system in construction is developing in Japan. In the beginning computer software were developed for the design of simple structure numerical calculations, execution planning and estimation. During 1980-1985 attempts were made to perform analysis focused on the flow of information of overall projects including the execution stage. The analysis was done for a typical road construction project. During the analysis, it was realize the establishment of the integration of construction information and standardization of data formats. In 1990-1994 information systems was used to control the compacting machinery in the earthwork execution system. In this case also, it was realize the standardization of CAD file formats/layers.

To solve the challenges facing the introduction of electronic information till 1994, construction CALS/EC Action program was conducted incorporation with concerned government and private agencies. The purpose of the work was to establish clearinghouse to make acquisition information and electronic bidding available in the Internet.

Many attempts have been made to apply information integrated construction system to construction projects, especially to earthwork, which generally involve repetitive series of excavation, leveling and compaction. To execute 6.8 million cu.m. Of excavation and banking, Taisei Corporation introduced an information integrated construction system by satellite. Kajima Corporation developed the control system to control the number of compaction and compaction thickness and Fujima also developed some system. Japan Construction Method and machinery Research Institute Tokyu Construction Co., and Topcon Corporation coordinated a system to perform three-dimensional control for a trial execution of earthwork in a road construction project.

Execution requires a combination of companies, machinery, apparatus as well as computerized systems. The construction management systems have to organize all cooperators and systems introduced in the site. It is necessary to establish a universal platform where information is exchanged smoothly between all parties involved in the construction work.

PWRI has been carrying out joint research in this field with LCPC that is conducting the European projects. Author is hopeful that the future information integrated construction systems will be compatible and are counted on to rationalize execution by promoting CALS.

300 mm Semiconductor Facility Design And Construction Issues

This paper developed a relationship of 300mm technology changes to facility design and construction issues. Continued improvements in the semiconductor fabrication factories' productivity are considered to be key in maintaining the manufacturers' overall productivity growth

in the future. Part of the productivity improvement must come through reduced costs and speed of delivery of the constructed facility. Five areas were identified as having significant influence on the design and construction of 300mm fabrication facilities: 1) increased automation of the material handling system, 2) changes in process tool designs, 3) increase in utility consumption, 4) change in cleanliness requirements, and 5) change in project delivery techniques associated with the compressed schedule. The paper presented these issues in terms of space, layout, structure, materials, and schedule. These areas of facility construction changes represent realistic research opportunities to resolve the uncertainties and challenges that surround the design and construction of 300mm wafer fabrication facilities.

3. Discussions

Other than necessity and technological breakthrough, economy is the key for the feasibility of a new technology. Lively discussions were held centering around this issue. When the new Maglev Shinkansen is believed to become financially viable? How much cost is going to be saved by the introduction of the new site information system? How big is the magnitude of the new demand being created by 300mm wafer fabrication industry for the construction industry? These are some of such questions discussed in the session.

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