R&D Activities for Engineering Business in the Future

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Engineering business is an integration of informational and intellectual works to provide plant, equipment, and solutions to the customer with maximum cost-performance. The business fields of industry to which these services are provided change continuously over time, responding to current requirements. While the domain of NKK's engineering business began mainly with shipbuilding, it has since expanded to cover energy industries, environmental industries, water and wastewater, plant engineering, steel structures, and shipbuilding and offshore structures.

The severity of the business environment has required new company structures. To re-establish the competitiveness of business, a new company will be established by NKK and former competitors to integrate business operations for shipbuilding and offshore structures, and another company for steel plant engineering. With other operations covering the rest of engineering businesses, JFE Engineering Co. Ltd., will soon commence its operations.

For this reason, this is the last NKK Technical Review, and with this in mind I intend to touch on the history of the company as a means of confirming the path the company has trodden in its engineering operations since its establishment. When glancing over the history of the company, one cannot but be aware of the 1972 policy statement of the Heavy Industry Division, the predecessor of the current Engineering Operations Division. This statement was focused on 'the establishment of a unique organization devoted to integrated engineering', and 'the selection of primary business areas and needed technical development, and the strengthening of the organizations devoted to individual projects'. These primary areas encompassed energy, national land development, and environmental protection. Company operations have subsequently developed along these lines, and current operations have much in common with the original policy.

A consideration of these operations reveals two factors which are important under the current severe economic conditions, both being absent during the period of high economic growth which Japan formerly enjoyed. One is the drop in demand from the public sector, and the other is globalization. Further consideration also reveals considerable differences in the nature of technical development. During the period of high economic growth, the entire nation was focused on the establishment and expansion of social capital and energy infrastructure and environmental protection, with continually expanding investment and aggressive market expansion (public sector demand). Under these conditions, stable growth was expected without taking risk, and through simple linear enhancements in technology and products. The business environment has recently begun to exhibit major changes. The limits of growth with this previous method of operation have been reached to the point where new challenges are necessary. Continuous technical improvement and expansion in areas of operation are required to overcome the severe situation such as a reduction in public sector demand. At the same time, the birth of new businesses employing innovative new technology is essential to create new markets. It is no exaggeration to say that the company has previously not encountered such a strong demand for technical development appropriate for markets able to provide future income.

The recent major research and development results based on an awareness of the situation are shown in **Table 1**. Such results are directly associated with an expansion in business in the order of anything between a few hundred million and a few tens of billions of Yen.

The majority of these results were begun with "proposed pilot studies" proposals by individual researchers, and have developed into products and expansion of business operations after passing through a process of cooperation between the operations divisions and the research and development division. This system, for proposals which focuses on independent thought in research and development with clarification of market trends, is expected to significantly contribute to the creation of new enterprises in future.

Table 1 Major technologies in the engineering field

(first orders received for 2000 - 2001)

Product (technology)
High-temperature gasifying and direct melting furnace *
High clean DX (volatilization and decomposition of dioxin from fly ash)
Biotube system (advanced sewerage treatment system) *
Sewerage sludge incinerator with circulating fluidized bed
NK-HIPER (highly earthquake-resistant line pipe)
NTS1500 (fully-automated and highly efficient tunneling method)
ECOARC (environmentally-friendly and highly-efficient electric arc furnace)
EBROS (endless bar rolling system)
Ax-Bow (axe-shaped bow with low added wave resistance under rough sea conditions) *
Shipbuilding SBM (highly efficient hull manufacturing system using simulation-based manufacturing)

* Examples of these technologies are shown in **Fig.1, 2**, and **3**.

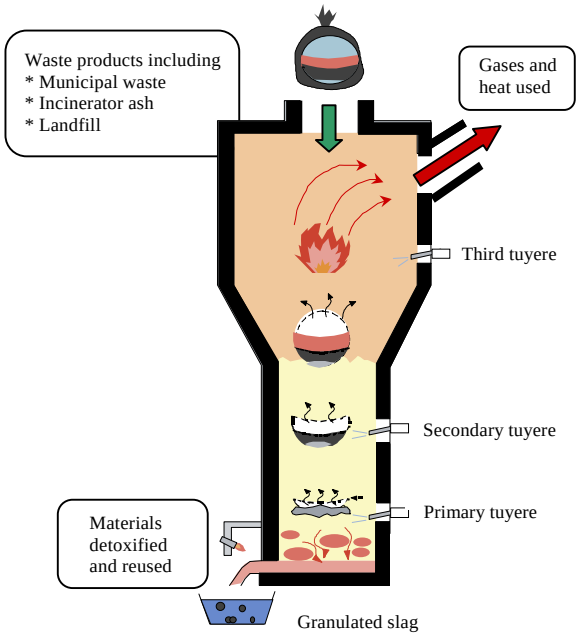

Fig.1 High-temperature gasifying and direct melting furnace

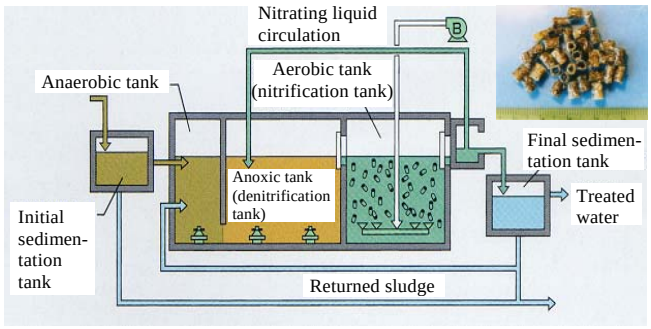

Fig.2 Biotube system

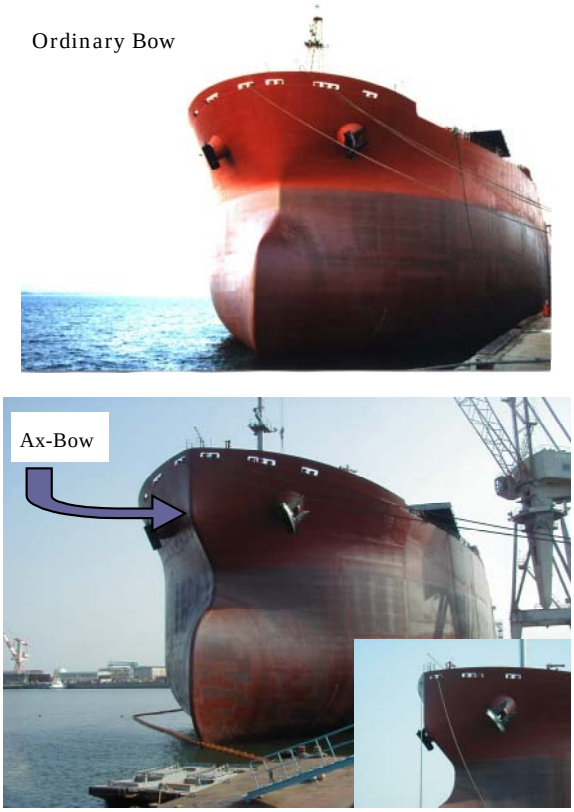

Fig.3 Ax-Bow

What are the new markets that we should focus on as a target in the future? New business or new market does not necessarily mean development of completely different business area. They retain some semblance of the present and as such retain the basic technology and management foundations, or are new fields close to conventional core businesses (the distance between the new and conventional fields varies with the character of the new business).

In practical terms, the emphasis is on the areas of (1) the environment and energy businesses, (2) the technologies to extend the life of industrial and social infrastructure, and (3) the comprehensive solutions businesses. Other applications of nanotechologies are also under consideration.

(1) The environmental and energy businesses

Resolution of global environmental problems such as global warming, and the development of a society able to recycle resources (zero emissions), are major topics. These will be implemented through the development of epoch-making energy-saving technology, renewable energy, and recycling technology etc, together with development and growth to maintain the environment and coexistence. For example, Clathrate hydrate slurry technology in the field of energy-saving, technology for a hydrogen gas for society in the field of renewable energy, and highly efficient gasifying technology in the field of recycling.

(2) The technologies to extend the life of industrial and social Infrastructure

This field is the one in which requirements invariably increase in terms of LCC (Life Cycle Cost), and considerable work is continuing in relation to technical development in preventative maintenance, estimation of residual life, and prolonging life.

(3) Comprehensive solution businesses

These businesses provide solutions to customer requirements, and needs in the wider world, in terms of the maximum cost-performance employing a business model incorporating social needs to achieve goals from the point of view of overall optimization.

The approach to globalization of society, a further major change in the enterprise environment, is considered as follows.

While there is a tendency towards protection of industries, globalization should be viewed positively as a good opportunity for growth. With globalization comes movement of business across national borders, and enterprises with creative business concepts, and technology and products, will develop into a massive international market. The creation of major opportunities for growth will be limited to businesses creating top global brands of products and technologies. Success or failure will depend significantly on the creation of unique technologies, called “Only One Technology”. In this sense as well, the role of technical development is becoming increasingly important, particularly in the fields of the environment and energy which are associated with typical global requirements. NKK is very much aware of the need for resolution of these requirements to ensure strong and continuous growth.

We live in an age in which the value and price of technology and products is determined by the market, and risk-taking (and risk management) is required in seeking profits and growth. The engineering business needs an entrepreneurial approach - a strong will and a sense of responsibility and passion in one’s work, and an ability to foresee market changes and develop new businesses with innovative technology. A number of possibilities exist, and much is expected of them in the future.

The great changes occurring in the business environment requires a greater speed of technical development, and a wider approach to overall optimization. It is not necessary to consider solely one’s own surroundings, rather it is better to fuse the strengths of one’s own company and of others in order to develop a win-win co-operative situation, and thus ensure that targets are met earlier rather than later.

It is necessary to maintain a good balance between ‘short-term development focused on strengthening competitiveness of existing businesses’ and ‘medium and long-term development focused on the creation of new products and businesses’ in reference to current trends. In both cases the objective is to promote growth and income-earning ability of the business through strong and superior technology.

We have presented a few of my opinions in this paper for the final edition of the NKK Technical Review. The following introduces a number of research and development examples, which we consider will support the engineering business in the future. Your interest in NKK’s technical approach to the future is much appreciated.