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**PRODUCT LINE STRATEGY ADOPTED BY SMALL SCALE MOTOR AND PUMP INDUSTRY**

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**ABSTRACT**

*An important product strategy for firms in mature markets is value-adding modifications to existing products. The developing organization, through in-depth understanding of the customers and the marketplace, introduces a product with a high performance at a low cost. This paper is focused on analysis of product line modification and examined the determinants influencing product line modification to enhance the competitiveness. The study is based on both primary and secondary data. Primary data were collected from a sample survey of 246 small scale motor and pump manufacturers in Coimbatore region of Tamilnadu state. The results show that competition is an important determinant for the product line modification. The study concludes that there is significant relationship between year of establishment, forms of organization and determinants influencing product line modification.*

**KEYWORDS**

Competitiveness, Motor and Pump Industry, Product Line Modification and Small Scale Industry.

**INTRODUCTION**

Indian pumps have contributed to the nation's economy significantly. Prominent sectors amongst them are agriculture, onshore and offshore production of oil and natural gas, petroleum refining, petrochemicals, mining, ship-building and marine duties, power generation, public water supply and sanitation, domestic and household utilities, process industries producing fertilizers, insecticides, pesticides, drugs and pharmaceuticals, textiles, soaps and detergents, cosmetic and health care products, dairies, vegetable oil and processed and packed food products, breweries, paints, etc. Presently, the gross value of pump's production in India is estimated to be US\$ 450 million (approx. 1.2 million units). The scales of production and corporate structures of manufacturers range from the small scale industries, medium to large scale industries, both in the unorganized sectors and also public sector units. In terms of drive ratings, the range of manufacture extends from fractional horsepower designs to large pumps of drive rating of the order of three MW. The world market for industrial pumps will grow by 19 percent through 2015 and reach \$40 billion. Thirty percent of the total sales will occur in East Asia. Sales in East Asia are projected to rise to \$10.6 billion in the year 2012. Sales of pumps to the power industry in East Asia will account for \$1.2 billion in sales revenue.

The pump industry will continue to undergo deep structural changes. The most important factor in the growth of the pump industry will be the increasing demand for decreasing supplies of uncontaminated water. Remediation of contaminated ground water, desalination of seawater, and other treatment processes will increasingly be needed to make use of this resource. Asia has less available water per capita than other continents and will also have a more rapidly increasing demand for delivery and treatment of that water. Therefore, almost half the investment in pumps for water-related applications will come from Asia. The urbanization of Asia involves the relocation of more than one billion people from the farms to the cities. This will create a huge need for infrastructure including delivery of drinking water and removal and treatment of wastewater. Rapid growth of the pump market in Asia will also be aided by large investments in pulp and paper, chemical, steel, and other basic industries.

**FACTORS FOR PUMP AND MOTOR DEVELOPMENT**

**INDUSTRIAL REVOLUTION:** Pump industry had gained momentum by the massive demands of the industrial revolution that built our modern society.

**GROWTH AFTER WORLD WAR II:** To satisfy the increasing demand that had gone due to war emphasis was on large, multistage electric utility boiler feed water pumps and oil-field injection and pipeline pumps.

**ENERGY CRISIS:** Energy crisis all over world led to the research and development for developing energy efficient pumps and systems.

**ENVIRONMENTAL CHALLENGES:** Curbing emissions was the challenging concern. This influence has led to better sealing of pumps and the ultimate product was integral motor pump.

**GLOBALISATION:** MNC emphasize quality, productivity and faster delivery of the product to meet the global market share. The technical improvements will continue to be necessary to maintain global competitiveness.

**STATEMENT OF PROBLEM**

International pump community has been viewing the globalization of Indian economy with growing interest. Considering the maturity and initiative on technological aspects, evident in the Indian pump industry, the strategy of importing pumps manufactured abroad for sale in the Indian market does not appear to be workable. Also the ground realities of the poor power supply may often demand modifications. To be competitive, product line needs to be modernized. A company product might be old product and lose out to newer-styled competitors' lines. In rapidly changing product markets, modernization is carried on continuously. Companies plan improvements to encourage customer migration to higher-valued, higher-priced items. A major issue is timing improvements so they do not appear too early or too late. Product-line managers must periodically review the line for dead product that is reducing profits.

**REVIEW OF LITERATURE**

Competitiveness is a multi-dimensional concept. This is evident, for instance, in the analysis of its nature, types and levels in manufacturing industries and trade by Kathuria (1995), Narayana (1993), National Productivity Council (1999), Siggel (2001), Government of India (2002), Banwet *et al.* (2002) and Gowswami & Dollar (2002). Competitiveness explains the ability of Small-Scale Industries (SSIs) to generate income/output and maintain employment levels in the face of domestic and global competition. Consequently, in the absence of competitiveness, SSIs may face the problem of sickness or closure. Hence, all policy efforts to enhance and strengthen competitiveness will have implications for preventing both sickness and closure of SSIs. Policy literatures on India's SSIs in post-WTO were carried out at a national level of aggregation. The importance has to be given for intra-regional study on determinants of competitiveness in India. This type of studies will have the potential to deliver policy implications to correct for inter-regional imbalances, because they are related to competitiveness of SSIs. The analyses in this paper are intended to enhance and strengthen national and global competitiveness of SSIs by way of modifying existing and adding new products. However, the analysis and results of this paper are of relevance and applicability for other industrial sectors.

**OBJECTIVES**

1. To examine the products manufactured before and after product line modification.
2. To analyze the determinants influencing modification in the product line.
3. To measure the relationship between year of establishment and determinants influencing product line modification.
4. To measure the relationship between forms of organization and determinants influencing product line modification.

**HYPOTHESIS:** There is no significant relationship between the year of establishment and determinants influencing product line modification

**HYPOTHESIS:** There is no significant relationship between the forms of organization and determinants influencing product line modification

## METHODOLOGY

The analysis in this paper is based on both primary and secondary data. Primary data were collected through questionnaires from motor and pump manufacturing firms in Coimbatore city, Tamilnadu. For this purpose a sample of 246 units were selected from SIEMA. The secondary data were collected from District Industries Center (DIC), Micro Small and Medium Enterprise Development Institute (MSME-DI), National Small Industries Corporation (NSIC), Coimbatore Small Scale Industries Association (COINDIA) and the Southern India Engineering Manufacturers Association (SIEMA). The collected data were classified and tabulated. The statistical tools used to analyze the study were descriptive and chi-square analysis.

## CONCEPTS

### PUMPS AND MOTORS

#### MOTOR

An electric motor is a device which converts electrical energy into mechanical energy. When electrical energy (Power) is applied to a motor, a magnetic field is created by the stator winding and a torque is produced, so as to rotate the rotor. This energy is transferred to the shaft (mechanical energy). The mechanical energy produced can be used for driving a pump. Hence it is termed as the main prime mover.

#### PUMP

A pumping system consists of a pipe, a mover piping system and a foot valve. The pump is driven by the prime mover. The commonly used movers are the electric motors. A pump works on the principle of centrifugal force. The water is sucked and is thrown outside from the center.

## ANALYSIS AND INTERPRETATION

### YEAR OF ESTABLISHMENT

Although some pumps were used in 19th century, the real growth of Pump Industry took place in 20<sup>th</sup> century. Multistage Centrifugal Pumps were developed in 1905. In 1929 innovation was done in the problem of pressure pulsations in large hydraulic turbines and pumps. Dependence of cavitations' erosion on liquid was established in the year 1955. During 1994 innovation was done to find out how far the cavitation can cause profound instabilities in pump and inducer operation. 1990-2000: It is found that sometimes obscure fluid phenomena can produce mechanical instability in rotodynamic pumps. In Coimbatore the first pump was developed in the year 1928. The stimulus for growth came mainly from the emphasis on development of agriculture sector and the strengthening of the industrial sector during the successive 5 year plans. From 1991-1992 to 1995-1996, the pump industry growth was driven mostly by the boom in industries and urbanization due to the liberalization policy.

**TABLE 1: YEAR OF ESTABLISHMENT**

Year	Frequency	Percent	Valid Percent	Cumulative Percent
Before 1990	65	26.4	26.4	26.4
1991-2000	92	37.4	37.4	63.8
After 2000	89	36.2	36.2	100.0
Total	246	100.0	100.0	

Table 1 presents the details of the year of establishment by the respondents under study. 37.4 percent of the respondents have established their concern during the year 1991- 2000, comparatively there was a marginal decrease in the percentage of enterprise started after 2000(36.2%), and the remaining 26.4 percent of the respondents have established their concern before the year 1990.

### FORMS OF ORGANISATION

The pump industry consists of medium and small units producing pumps for sectors from agriculture to nuclear power generation. They are in both organized and unorganized sectors. The forms of organization in the motor and pump industry are sole proprietor, partnership firm and company

**TABLE 2: FORMS OF ORGANIZATION**

	Frequency	Percent	Valid Percent	Cumulative Percent
Sole proprietor	118	48.0	48.0	48.0
Partnership firm	101	41.1	41.1	89.0
Company	27	11.0	11.0	100.0
Total	246	100.0	100.0	

Table 2 shows out the forms of organization. 48 percent of the respondents were sole proprietors, 41.1 percent of the respondent's owed partnership firms, 11 percent of them owed Company form of organization.

### CAPITAL INVESTMENT

To meet the quality standards and to increase the productivity modern machineries are to be used. Small and medium pump industry had invested capital ranging Rs 1 crores to Rs. 5 crores.

**TABLE 3: CAPITAL INVESTMENT**

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than Rs.2 crores	105	42.7	42.7	42.7
Rs.2-5 crores	133	54.1	54.1	96.7
Above Rs 5 crores	8	3.3	3.3	100.0
Total	246	100.0	100.0	

Table 3 gives the explanation on the amount of capital invested. 54. 1 percent of the respondents' investment ranges between Rs. 2 crores to 5 crores, 42.7 percent of the respondents have invested less than Rs.2 crores, and a least of 3.3 percent of the respondents have invested above Rs. 5 crores.

### PRODUCT MANUFACTURED BEFORE PRODUCT LINE MODIFICATION

Pump manufactures were manufacturing various products to meet the domestic and foreign markets. The range of product manufactured extends from fractional horsepower designs to large pumps of drive rating of the order of three MW. Almost all types of pumps manufactured internationally, are also made in India.



**TABLE 4: PRODUCT MANUFACTURED BEFORE PRODUCT LINE MODIFICATION**

	Frequency	Percent	Valid Percent	Cumulative Percent
Ordinary belt drive	60	24.4	24.4	24.4
Centrifugal belt drive	5	2.0	2.0	26.4
Gland type jet pumps	24	9.8	9.8	36.2
Jet centrifugal pumps	23	9.3	9.3	45.5
Open well submersible (Three phase)	21	8.5	8.5	54.1
Bore well submersible(Three phase)	18	7.3	7.3	61.4
Air and mono compressor	10	4.1	4.1	65.4
Bore well submersible(single phase)	20	8.1	8.1	73.6
open well pumps (single phase)	65	26.4	26.4	100.0
Total	246	100.0	100.0	

Table 4 shows the products manufactured before product line modification, 24.4 percent of them were producing ordinary belt drive, 9.8 percent of them were producing gland type jet pumps, 9.3 percent of the respondents were producing jet centrifugal pumps, 7.3 percent of the respondents were producing open well submersible pumps, 7.3 percent of the respondents were producing bore well submersible, 4.1 percent of the respondents were producing air and mono compressor pumps and the remaining respondents were producing other forms of pumps.

#### PRODUCT MANUFACTURED AFTER PRODUCT LINE MODIFICATION

Most of the world-renowned technologies have been operative in India. Majority of them seem to be European, to name a few, KSB, Sulzer, Weir, SPP, Allweiler, Bornemann, Alstom, Stork, Terromecanica, Godiva, Pleuger, Grundfos, ABS, Flygt, Denver Orion, etc. Amongst them American, Japanese and Australian technologies can be sighted in Wrthington-Dresser, Ingersoll Rand, Goulds, Durco, Ebara, Asia LMI, Warman, etc. Indian technical skills and engineering aptitudes have shown good capabilities of almost immediate absorption of the involved design, manufacturing and quality control specifications and application engineering needs. The Indian craftsmen are often enterprises in reverse engineering at very competitive costs. Amongst the notable achievements of indigenous development and research and development can be cited, the primary coolant pumps and sodium coolant pumps for nuclear power, large 2250 mm delivery-size vertical turbine pumps and concrete volume pumps for cooling water circulation in thermal power generation can also be cited. Pump manufacturers in Coimbatore have altered their product line to sustain in the market and to meet the competitive demand. Certain addition, deletion and up gradation are done in their existing product line.

**TABLE 5: PRODUCT MANUFACTURED AFTER PRODUCT LINE MODIFICATION**

	Frequency	Percent	Valid Percent	Cumulative Percent
Self priming monoblock	34	13.8	13.8	13.8
Mini mono block	57	23.2	23.2	37.0
TEFC jet pumps	13	5.3	5.3	42.3
Open well submersible(Three phase)	25	10.2	10.2	52.4
Bore well submersible(Three phase)	62	25.2	25.2	77.6
Hydraulic ram pumps	33	13.4	13.4	91.1
Velocity pumps	22	8.9	8.9	100.0
Total	246	100.0	100.0	

Table 5 explains the products manufactured after product line modification. 25.2 percent of the respondents were producing bore well pumps, 23.2 percent of the respondents were producing mini mono block pumps, 13.8 percent of the respondents were producing self priming mono block, 22.3 percent of the respondents were producing other forms of pumps, and 5.3 percent of the respondents were producing TEFC jet pumps.

#### DETERMINANTS INFLUENCING PRODUCT LINE MODIFICATION

Pump industry have changed their product line due to many factors. Some of the factors are reduce the cost, to manufacture the product according to the customers' specifications, to meet the competition, advancement in the technology etc.

**TABLE 6: DETERMINANTS INFLUENCING PRODUCT LINE MODIFICATION**

	Frequency	Percent	Valid Percent	Cumulative Percent
Cost consideration	40	16.3	16.3	16.3
Changes in the customers requirement	51	20.7	20.7	37.0
Competition	79	32.1	32.1	69.1
Technical advancement	37	15.0	15.0	84.1
To increase the sales	25	10.2	10.2	94.3
To sustain in the market	14	5.7	5.7	100.0
Total	246	100.0	100.0	

Table 6 presents the details of determinants influencing modification in the product line. 32.1 percent of the respondents have opined that the reason for product line modification was to face competition. 20.7 percent of them have indicated, it was due to changes in customer requirement, 16.3 percent of them have stated it was due to cost considerations, technical advancement was the reason for 15 percent of the respondents. 15.9 percent of the respondents have modified to increase the sales.

**HYPOTHESIS:** There is no significant relationship between the year of establishment and determinants influencing product line modification

**YEAR OF ESTABLISHMENT AND DETERMINANTS INFLUENCING PRODUCT LINE MODIFICATION** Entrepreneurs established their enterprise before the year 1990 has changed their product line to reduce their cost. Competition was the main factor for product line change for the manufactures that have started their firm during 1991-2000. Technology was the main criteria for the change for the entrepreneurs who have established after the year 2000.

TABLE 7: YEAR OF ESTABLISHMENT AND DETERMINANTS INFLUENCING PRODUCT LINE MODIFICATION

		Determinants influencing product line modification						Total
		Cost consideration	Changes in the customers requirement	Competition	technical advancement	To increase the sales	To sustain in the market	
Year of establishment	Before 1990	25	17	17	0	0	6	65
	1991-2000	15	15	40	7	9	6	92
	After 2000	0	19	22	30	16	2	89
Total		40	51	79	37	25	14	246

TABLE 8: CHI-SQUARE TESTS

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	91.057 <sup>a</sup>	10	.000
Likelihood Ratio	110.844	10	.000
Linear-by-Linear Association	32.864	1	.000
N of Valid Cases	246		

a. 1 cells (5.6%) have expected count less than 5. The minimum expected count is 3.70.

The table 8 shows that (asyp.sig value is <0.05) hypothesis is rejected. There exist no differences between the year of establishment of business and determinants influencing product line modification

**HYPOTHESIS:** There is no significant relationship between the forms of organization and determinants influencing product line modification

#### FORMS OF ORGANISATION AND DETERMINANTS INFLUENCING PRODUCT LINE MODIFICATION

Entrepreneurs who have the form of organization as sole proprietor and partnership have gone for modifying their product line due to competition. To meet the customer specification company forms of organization have made the changes in the product line.

TABLE 9: FORMS OF ORGANIZATION AND DETERMINANTS INFLUENCING PRODUCT LINE MODIFICATION

Forms of organisation	Determinants influencing product line modification						Total
	Cost consideration	Changes in the customers requirement	Competition	Technical advancement	To increase the sales	To sustain in the market	
Sole proprietor	25	20	30	17	16	10	118
Partnership firm	14	20	43	13	7	4	101
Company	1	11	6	7	2	0	27
Total	40	51	79	37	25	14	246

TABLE 10: CHI-SQUARE TESTS

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.444 <sup>a</sup>	10	.005
Likelihood Ratio	26.364	10	.003
Linear-by-Linear Association	.640	1	.424
N of Valid Cases	246		

a. 4 cells (22.2%) have expected count less than 5. The minimum expected count is 1.54.

The table 10 shows that (asyp.sig value is <0.05) hypothesis is rejected. There exist no differences between the nature of business owned by the entrepreneurs and determinants influencing product line modification

## DISCUSSION AND CONCLUSION

In the study majority of the pump and motor enterprises established their concern during the year 1991- 2000. During these years there was a boom period which was favorable for the development of industry in Coimbatore. Many ancillary units were also established that paved way for the fast development of motor and pump industry. Majority of respondents have started pump and motor enterprises as sole owners with capital ranging from Rs.2-5 crores during the year 1991-2000. Before modification, open bore well and ordinary belt drive was occupied in their product line. After modification certain type of motor pumps were removed from the product line and certain other were upgraded and introduced in the new form according to the needs of the customers. Entrepreneurs have upgraded or dropped the products from the product line mainly to meet the competition, customer's requirement and also to reduce the cost. Competition is a main factor influencing the modification in the product line for entrepreneurs in sole proprietor and partnership form of organization. Changes in customers requirements is the factor for modification for company form of organization. The study also indicates that there exist significant relationship between year of establishment, forms of organization and determinants influencing product line modification.

International company having a manufacturing base in India can prove strategic, not only for the Indian market but for catering to markets in Africa, Middle East, South East and Far East. Ready availability of skilled, qualified and intelligent, engineering, managerial and technical manpower ought to prove a very confident, strong point for investing in an Indian manufacturing base.

## SCOPE OF THE STUDY

In the midst of the recession in the world, the growth of the motor and pump industry has been affected. It is the one of industry which generates direct and indirect employment in India. Further study can be focused in the prospective, productivity, profitability of the motor and pump industry and factors affecting the pump and motor industry's growth.

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