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Spanish Shipbuilding: Restructuring Process and Technological Updating From 1984 to 1994

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ABSTRACT

In 1985, the Spanish commercial shipbuilding sector initiated a wide restructuration program due to the deep crisis sustained from 1975 as a consequence of the surplus shipbuilding capacity and an order book reduction related to the oil crisis.

This restructuration program has been developed in several phases, the main features of which are related to capacity and workforce adjustment by one side, and technological updating by other side.

Therefore, this paper has been prepared to give a general view of the different steps carried out by the Spanish commercial shipbuilding sector for accomplishing a more competitive industry, according to the actions realized in the European countries and the characteristics of the Spanish political, economical and technological situation.

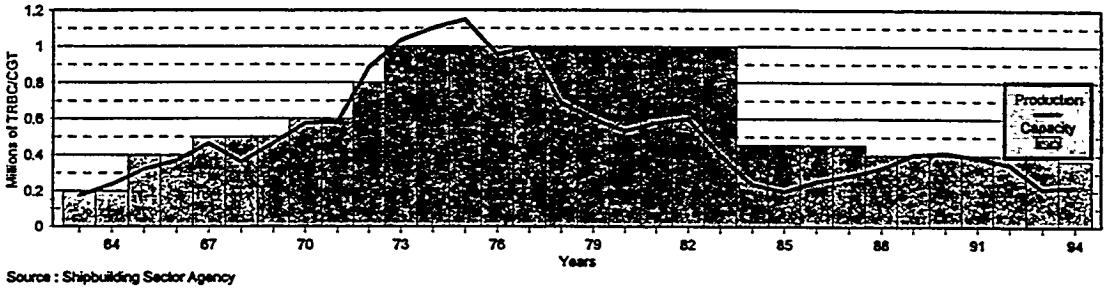
BACKGROUND

The Spanish shipbuilding sector had an intense increase in capacity during the middle of the 60s.

It was a period of strong economic growth in Spain during which the Spanish authorities considered that the shipbuilding sector could act as the propeller of the development of the whole Spanish industry, thus the shipbuilding sector benefited from strong support.

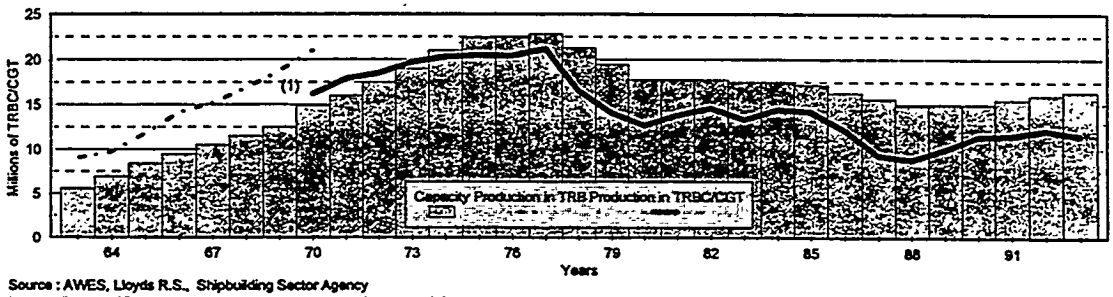
Therefore from 1963 until 1973 the shipbuilding capacity in Spain multiplied by 5, overtaking 200,000 CGT to more than a million. The 70s was the most brilliant period for Spanish shipbuilding, occupying a place among the frost five countries in worlwide production ranking with Japan, Sweden, Germany and United Kingdom.

This increase in Spanish shipbuilding capacity from 1963 to 1973 had its parallelism worldwide due to the fact that the global production multiplied by 4 during this same period (See Figures 1 and 2).



Source : Shipbuilding Sector Agency

Figure 1 Spanish Shipbuilding Capacity and Production



Source : AWES, Lloyds R.S., Shipbuilding Sector Agency
Note 1 : Before 1970 there are data of Worldwide production only in TRB

Figure 2 Worldwide Shipbuilding Capacity and Production

But, it was about 1976 when the reduction of production and capacity, worldwide, began. The oil crisis of 1973 was the main cause of the shipbuilding crisis which has continued, with small fluctuations, for more than 20 years with a strong unbalance between supply and demand. That was provoked by the creation of a great number of shipyards for the construction of large oil tankers, which then had to dedicate themselves to the construction of other types and sizes of vessels. That gave way to the proliferation of subsidies worldwide with, luckily, will disappear at the beginning of 1996 thanks to the Organization for Economic Cooperation and Development (OECD) agreement reached in July of 1994.

This crisis provoked a workforce reduction of the shipbuilding sector with the OECD countries of 50% between 1976 and 1984, a percentage which was nearly accomplished as far as the capacity reduction of the OECD shipyards was concerned. Spain was, however, an exception since during the 1976-1984 period, only a 3.7% general workforce reduction was produced and still maintaining the construction capacity (see Figures 3 and 4).

However not being able to keep production according to its capacity, the Spanish shipbuilding sector suffered economic and technological decline. This changed in 1985 with the start of the first Phase of Restructuration that ran from 1984-1987.

The cause of this important delay in starting the rectructuration of the shipbuilding (and the Spanish industry generally), was the political and economical transition process which happened in Spain as a consequence of the change in the political control which occurred in 1975. Neither the political parties nor the Spanish trade unions were in a condition to simultaneously afford both the process of political change and the industrial restructuration. That would have provoked strong labor disputes increased by the fact that the industrial restructuring process coincided with the return of a great number of Spanish workers who were emigrants in European countries also involved in their own industrial restructuring processes.

In 1984 extensive negotiations took place among trade unions, employers and the Spanish Administration, concluding on the necessity to

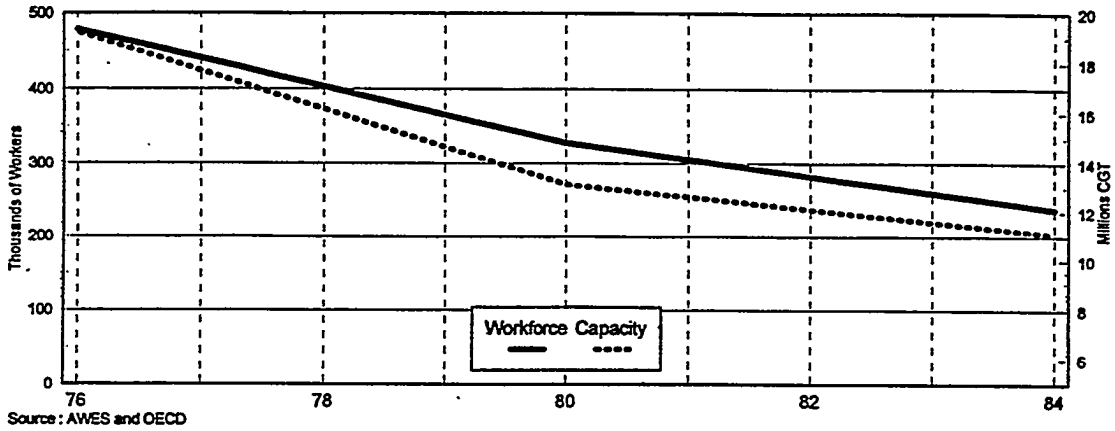


Figure 3 Capacity and Workforce Reduction in O.E.C.D. (From 1976 to 1984)

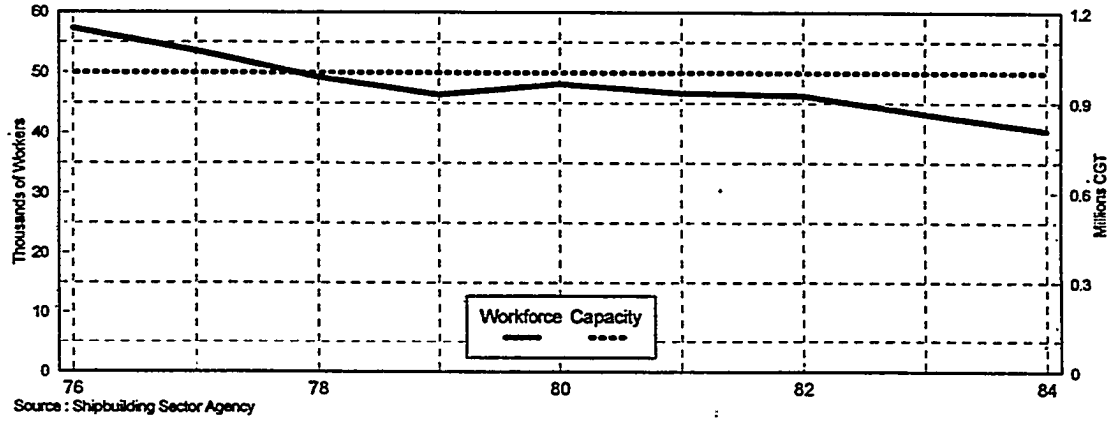


Figure 4 Capacity and Workforce Reduction in Spain (From 1976 to 1984)

undertake an intense process of restructuring in shipbuilding. At that time the situation was the following

1. An excess of workforce of nearly 40%,
2. An excess of capacity of 55%,
3. A serious technological deficiency due to lack of investment made in the previous decade,
4. An important economic decline, especially the public sector, and
5. A decline of commercial image.

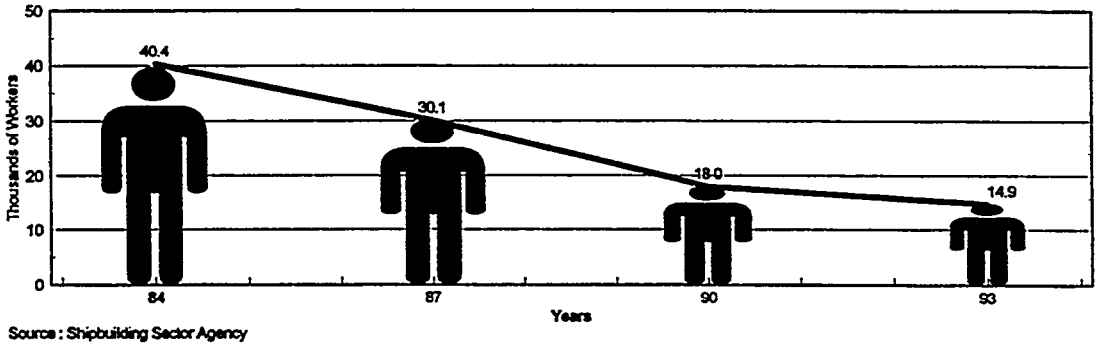
In order to carry out the shipbuilding restructuring process, the sector was subdivided into two subsectors of different characteristics: one being the big shipyards, all of them of public capital, and the other of small and medium shipyards, where the majority belong to private capital (except three of them). Both subsectors were similar in capacity and workforce, although technologically they showed certain differences in favor of the big and medium shipyards belonging to the same business group.

FIRST PHASE OF THE RESTRUCTURATION FROM 1984 TO 1987.

The serious initial situation of the sector was obliged to approach all problems simultaneously still knowing the serious difficulties consistently with the trade unions and workforce situation nationwide. Fortunately, after hard worldwide negotiations, agreements were made with most representative trade unions without whom it would have been impossible to imagine any restructuring plan to be presented.

The restructuring plan in this first phase was basically confined to the following

1. Reduction of the workforce from 40,000 to 30,000 workers, mainly by means of pre-retirement (25% reduction) (see Figure 5); and



Source : Shipbuilding Sector Agency

Figure 5 Workforce Reduction in Spain (From 1984 to 1993)

2. Closing of capacity from 1,000,000 CGT down to 445,000 CGT by means of closing 6 shipyards and changing activity of two big shipyards from new construction to repairs and/or off-shore.(See Figure 1)

This phase coincided with a declining market situation worldwide, so production maintained inferior levels to the defined capacity for the sector.

From the technological point of view in analysis of this first phase, it is more appropriate to subdivide the sector between public and private shipyards. The two groups of shipyards are analyzed as of 1985:

Public shipyards

The public shipyards lacked, at the beginning of the reconversion, the following technological matters:

1. They lacked advanced computer applications of the CAD/CAM type. Design proceses were done by a traditional method of systems.
2. Building of a hull was done by means of blocks, although these were manufactured with overlaps. The level of preoutfitting was low.
3. Planning wasn't very functional due to the variability of the building proceses.
4. Quality, limited itself to the control functions, which was carried out "posterioris", that is to say after a product was made.
5. The levels of training and multifunctionality of staff were quite low.
6. In the commercial area, the response capacity was low and the marketing deficient.
7. In the area of purchases, delays with supplies were frequent.
8. As far as the means and layout installations were concerned, there was a need to replace obsolete machinery, redistribute the flows of the materials, extend workshops and generally improve installations.

Private Shipyards

Given the greater diversity of the private shipyards subgroup, it is difficult to do a homogeneous analysis of its situation, but some common aspects can be pointed out which allow identification of the

technological level of this group, which on average was inferior to the public shipyards. Their main limitations are listed below

1. The practice of computer applications with regard to calculation or basic design was absent; the ship drawings were done by the traditional procedure of systems.

2. For hull construction, flat blocks were premanufactured, but, in general, curved blocks were not. Fitting of steel plates on curved blocks was done on building berth. Preoutfitting, generally, did not exist.

3. Marking and cutting processes were done in the smaller shipyards by hand and to a scale of 1:1; in the bigger ones, to a scale of 1:10 together with cutting by machinery of optic control.

4. Primary welding was done manually, plate welding was done on both sides.

5. Management and control systems were deficient.

6. Quality was reduced to those controls required by the rules.

7. The levels of staff qualifications were relatively low.

8. Portable equipment, especially adapted tools, were scarce.

9. The commercial area was limited due to the fact that with small shipyards, they usually relied on traditional clients, in close geographical proximity.

10. Finally, shipyard physical plants suffered from many shortages, especially in workshops means of lifting, transport and machinery, were especially lacking.

In this period, investments were scarce due to shipyard situations. Most of the investments were dedicated nearly exclusively to the recovery of obsolete industrial equipment. Productivity levels improved nearly exclusively due to workforce reductions.

SECOND PHASE OF RESTRUCTURATION FROM 1987 TO 1990

The intensive workforce and capacity adjustmen done in the previous period put the sector in a more comfortable position to compete in the market, but there were still serious problems which, were stil more changes required

1. Additional workforce adjustment
2. Additional capacity adjustments,
3. Industrial investments,
4. Staff training, and
5. Improvements in marketing activity.

Spain was incorporated into the Europear Economic Community (EEC) in 1986. New restructuring programs for the shipyards were presented, but this time within the EEC Directive fo Shipbuilding Aids. The following results were achieved due to these programs

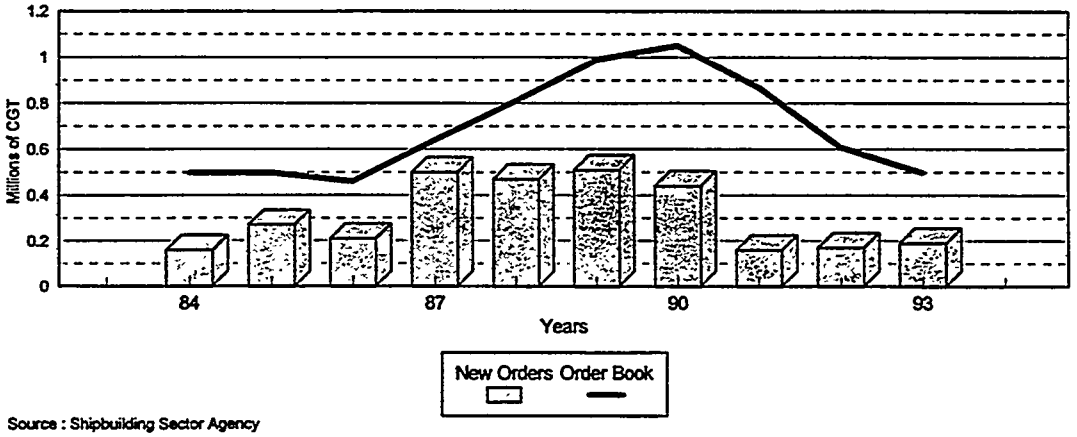
1. Additional workforce adjustment from 30,000 to 18,000 workers (55% from the 1984 situation), were made. (See Figure 5).

2. Additional closing of capacity from 455,000 CGT until 400,000 CGT (60% over the initia situation) was effected by closing another 7 shipyards definitely and changing the activity of another shipyard to repairs. (See Figure 1).

3. New investments, especially in industria installations (60% of the total) corresponding to 70% over the forseen programs and a total of around 3% of the shipbuilding sector turnover.

4. Staff training was started for those who remained in the shipyards where the workforce structure, after the strong adjustment of the previous period, was mostly unbalanced.

5. A favorable order book was secured in the 87-88 period (see Figure 6) due to:



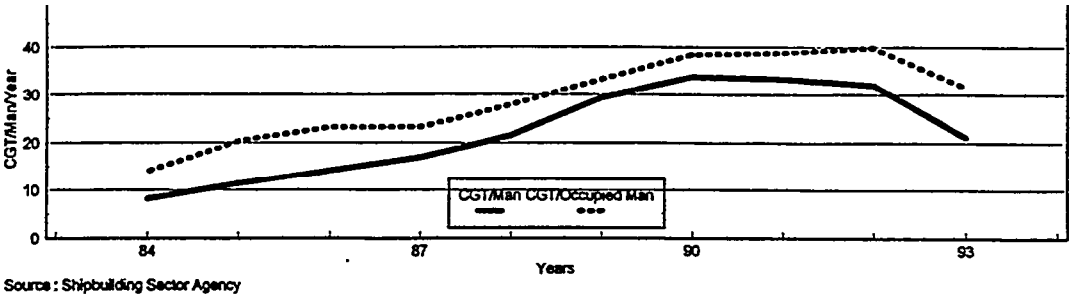
Source : Shipbuilding Sector Agency

Figure 6 Total Order Book and New Orders in Spain (From 1984 to 1993)

-improved competitive position,
- productivity improvements,
- improved commercial activity, and
- greater aids authorized by the EEC in the frame of the Community Directive.

6. Production levels during the years 1989 and 1990 were within the maximum limits of capacity established for the sector. (See Figure 1).

7. An important increase of productivity levels reached in 1989 and 1990 a figure close to 30 CGT/man/year, which had been considered a goal. (See Figure 7).



Source : Shipbuilding Sector Agency

Figure 7 Productivity Level in Spain (From 1984 to 1993)

Before starting this second phase, the Shipbuilding Sector Agency carried out a diagnosis of the technological situation which suggested taking two types of actions of urgent nature. One being the "soft" type, destined to make good the most urgent shortages of design and management. The other being the "hard" type to update the equipment and installations which was most needed in order to ensure a minimun level of quality and productivity.

Regarding the private shipyards, due to their dispersion, the work of the Shipbuilding Sector Agency consisted, in a first stage, not only in the specific definition of the type of projects to be developed, but, in certain cases, in the concrete definition of the fundamental characteristics of some projects, together with the coordination of the same. It was in these shipyards where most of the effort was carried out on "soft" actions starting with the umbrella projects. The public shipyards also participated in these projects, though at a different level. The most important projects were, in the area of CAD/CAM, Management Control, Welding, Quality and Applied Investigation.

As far as the development of the "hard" type was concerned, it was different between the public and private shipyards since the initial situation was as well.

Public shipyards

The public shipyards established five areas of investment performance, classified in the following way.

Impact, which contemplated those innovative measures in the organization of workshop flow and the updating of the installations to new manufacturing procedure,
Horizontal, seeking the best competitiveness va new methods of development, management and manufacturing procedures and systems as well as the specific training on these technologies and the development of new products;
Restructuration, which included those actions obliged by the targets and necessities of the Restructuring Plan undertaken by each shipyard;
Replacement which were aimed at keeping the availability of equipment, installations and existing tool kits; and
Safety and Social Health, whose target was to imporve the working conditions and the personal safety of the shipyards.

As far as the distribution of these investments, cost wise, it is shown in Table I:

Impact	Restruc.	Horizontal	Replace	Saf.	Total
29%	41%	9%	16%	5%	100%

Table I Distribution of Investments

In this phase, 70% of the investments were in the restructuring and impact areas, due to the important adaptation which had to be done in the installations, which were obsolete or generally not adequate enough.

Private Shipyards

A far as the private shipyards were concerned, in this period the primary investments were in workshops especially in steel processing machinery and, general services. Another significant area of investment was in computer systems and equipment. Investments are summarized in Table II:

CONCEPTS	1987(%)	1988(%)	1989(%)	1990(%)	AVERAGE(%)
BUILDING & OFFICES	8	14	6	6	8
LAYOUT AND GENERAL SERVICES	8	13	19	11	13
STEEL & FITTING WORKSHOP INST.	34	39	35	32	35
MACHINERY	43	20	24	38	32
COMPUTER	7	14	16	13	12

TABLE II PRIVATE SHIPYARD INVESTMENTS

One can see the importance of investments in workshops; though 80% of such value corresponds. exclusively to steel workshop installations; then the important volume of the machinery investment, especially for hull processes (the one dedicated to lifting means, being very important).

THIRD PHASE OF RESTRUCTURATION FROM 1991 TO 1993.

With regard to the global parameters, the Spanish shipbuilding sector achieved during the 1985-1990 period what the majority of European countries had achieved in 15 years, but with the following added difficulties.

1) A legislative as well as trade union work frame was more rigid than in other European countries. The work adjustment, therefore, has been more costly, slower, and less selective.

2) Location of the shipyards was in areas where they coincided with other restructuring processes with few reemployment alternatives (absolute absence of emigrant workers as with other European countries). There were strong unemployment level in such areas.

3) There were budget difficulties in the Spanish Administration to afford the restructuring achievements in such a short time, That caused a financial cost increase for the shipyards.

4) Continuation in other competitor shipyards from the EEC and Far East, of the productivity improvement processes which obliged the Spanish to establish more ambitious goals than those initially foreseen.

Due to the aforementioned, the Shipbuilding Sector Agency instructed the shipyards to present the performance programs for the 1991- 1993 period according to the following goals

1. The maintenance of the global capacity of construction;

2. Additional adjustment of workforce;

3. Detailed programs of technological improvement concentrating with more intensity on the improvement of the work organization, specifically in:

- Production Oriented Design,
- Application of Group Technologies,
- Application of Dimensional Control, and
- Application of Total Quality Management;

4. Assets investment programs;

5. Training of workforce;

6. Cooperative Marketing; and

7. Shipyards collaboration for combined use of assets.

The results achieved were the following.

1. Construction capacity was maintained at full production until 1992. Then it descended substantially. (See Figure 1)

2 The workforce dropped from 18,000 to 14,900 workers (a 63% drop from the start of the reconversion). (See Figure 5)

3. The average productivity of CGT /man/year until 1992 inclusive, maintained itself within the foreseen goals, having exceeded the 30 CGT/man but dropped in 1993.(See Figure 7).

4. The shipyards invested 90% of the total value foreseen in performance programs which represented 7% of the average turnover of the sector.

However during this period there were a series of difficulties which deteriorated the achievements obtained up to 1992. Contracting from the years 1991 to 1993 was very low due to:(See Figure 6)

- excessive strength of the peseta;
- depression of the national and international market, most of all during the years 1991 and 1992
- Budget difficulties which have affected the financing of the vessels and the financial costs of shipyards
- Strong decrease of the aids ceiling in the Community Directive, and
- Non-fullfilment of the marketing programs of the shipyards.

If the production of the years 1989 until 1992 had been close to saturation due to the order book which

was achieved during the years 1988 to 1990, 1993 was a very bad production year because of lack of contracting, starting from 1991, which has contributed to a worse economical situation of the shipyards in 1993.

The technological situation in this third phase (having finished the previous one mainly concentrated on installation investments), started with a different orientation. For this reason, the shipyards were asked for updated technological programs, which previously had been examined by the Shipbuilding Sector Agency for the purpuse of introducing the new constructive methods, group technology, production orientated design, quality, management and control systems.

The above mentioned technology programs were divided into three main concepts or types of investment

1. Investment in installation equipment and machinery;

2 Actions on improvement of organizations, of management and technological and

3. Actions corresponding to training courses and programs of work safety.

To summarize, Tables III and IV reflect some basic data of the technological programs developed during the 1991-1993 period, corresponding to the three concepts above. After carrying-out of technological programs from the 1991-1993 period, the shipyards situation can be summarized as follows.

Public Shipyards

1. The constructive methods have been practically implemented by zones and stages.
2. CAD/CAM systems are being widely applied.
3. The control and management systems have been brought up-to-date by means of computerization and the establishment of evaluation parameters.
4. The manufacturing processes have been standardized and dimensional precision has improved by means of statistical control of processes. Modular manufacturing has increased and high preoutfitting percentages have been realized.
5. Various shipyards have achieved certificates of Quality Assurance Systems 1S0 -9000.
6. Nearly all the welding is semi-automatic and automatic
7. The dimensional precision of curved plates has improved by means of 'line-heating" application.
8. The level of knowledge of the workers has widened, allowing establishment work systems by miltifunctional teams.
9. Total Quality Control (TQC) techniques are being applied for the introduction of continuous improvement systems. Likewise, the old system is being replaced by an autocontrol.

PUBLIC	CONCEPT	TOTAL NUMBER OF PROJECTS	% OF ALL PROJECTS	% COSTS
	1	523	33	34
	2	737	47	38
	3	318	20	28
	TOTAL	1.578	100	100

TABLE III

PRIVATE	CONCEPT	TOTAL NUMBER OF PROJECTS	% OF ALL PROJECTS	% COSTS
	1	426	48	61
	2	263	30	25
	3	192	22	14
	TOTAL	881	100	100

TABLE IV

10. The supply terms of vessel equipment have improved considerably at the same time as improving the suppliers qualification.

Private Shipyards

This group of shipyards that started from a technological situation that, in general,was worse than the public one, have accomplished a very significant progress in this area. The most relevant investments were of type 1 in installations, equipment and machinary. However, regarding type 2 and 3 investments, important progress has also been made.

For the type 2 projects, and given the dispersion of the private shipyards, joint projects between various shipyards have been organized.

After the technological programs of the 1991-1993 period, the average global situation of these shipyards is as follows. .

1. Most of them have CAD/CAM systems.

2 They find tehmselves in an initial phase of application of group technology, having increased substantially the level of preoutfitting.

3. The complete building of hulls is being done by means of prefabricated blocks. The application of line-heating techniques has improved quality considerably.

4. The use of semi-automatic and automatic welding has increased considerably. At the same time, one side plate welding processes with backing have increased.

5. The management control and planning systems have improved.

6. The training of the workers has allowed for a higher level of multifunctionality.

7. Quality assurance systems are being introduced. Several shipyards have certificates, type ISO-9000.

8. Installations, equipment and means have improveded the flow of materials and eliminate bottle necks.

CURRENT SITUATION

The decline suffered in 1993 due to the high grade of sub-activity, which still will not be fully resolved in 1994, warrants reconsideration of the restructuring plan of the Spanish shipbuilding sector. The extension of the EEC Directive until the end of 1994 has allowed the Shipbuilding Sector Agency to ask the shipyards to extend their programs forseen for the period 1991-1993, until the end of 1994. The Agency has held several meetings with the shipyards in order to try to define such performance which, in general terms, consists of:

1. An additional adjustment of workforce,

2 Continuation of the technological improvement, but exclusively in aspects related to the organization of work and training of staff (more investments in assets are not considered necesary at present);

3. More ambitious programs of marketing and

4. Collaboration between companies (geographically or by market type).

During 1994, the technological programs have been continuing from the 1991 -1993 period, though certain specific redirection had to be given. Specifically, and according to the current situation of the world market, these programs include, the following actions:

1. Activity plans of marketing and sales;

2 Plan of improved technology, concetrated on the introduction of the new building methods and quality systems, as well as the training of workers; and

3. Collaboration plans between companies in areas such as marketing, technical offices, purchases, production, technology, subcontracting, etc.

One of the most significant aspects of the current situation is the great importance that the Spanish Administration is giving to the marketing and commercial actions. In this sense it is important to point out that, favored by the Shipbuilding Sector Agency, a group of 10 shipyards has made a joint society for the elaboration and application of a global policy of marketing.

One other aspect which is being given great importance is the staff training in order to get better qualified as well as more competent and motivated workers. Another field which needs to be influenced is innovation of products. Moreover, the effort to improve quality continues, not only with shipyards, but also suppliers. After staff adjustments, the shipyard corresponds more and more as a 'synthesis business", where much of the manufacturing is external and it is in the actual shipyard where it is matched and coordinated for building up the ship.

CONCLUSION

The intensive restructuration of the Spanish shipbuilding industry, has been accomplished in a relatively short time compared with the same process in the other European countries. However, it is necessary to continue in this way in order for this sector become an effective synthesis business. Therefore, the following actions must be carried out:

1. To continue with the workforce adjustment up to the maximum compatible with the synthesis capacity

2 To continue with the workers training, and the recruitment of young and well qualified workers.

3. To maintain a constant effort to improve the production organization and the introduction of new technologies for building.

4. Incorporation of suppliers into the building process itself is fundamental in a "synthesis business" that shipbuilding is becoming.

5. Efforts of new technologies have to be done not only in CAD/CAM and/or use of robots, but also in process technologies like welding bending, handling of equipment, safety in work etc;

6. Training of workers in new systems and processes is essential for the introduction of the same.

7. Cooperation of the technical offices in the investigation and development of new products, and collaboration with university bodies and investigation institutes, shall bean important factor for competitive improvement.

8. Commercial and marketing actions must be sufficiently endowed to attend to market needs. These actions should be orientated to the maximun joint participation of the shipyards.

9. The Investigation and Development I&D, programs must be open for the adaptation of the technologies of other industries, where application is considered to be relevant for shipbuilding.

Finally, and in order to ease the application of realignment in shipyards, it is considered necessary to have a promoting and development system that contemplates the proper needs of shipyards, and eases the transfer and fitting of technologies used in other more advanced shipyards, or in other industries.