Quality Management System through Total Quality Management System

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Summary

Dr Kazimierz Krukowski, responsible for quality policy introduction in Szczecin Shipyard presents in his paper the way Quality Systems have evaluated since the beginning of the company till now. The paper describes how QMS (Quality Management System) has functioned in relation to ISO 9001, integration of Management System, and steps taken to introduce and then implement TQM (Total Quality Management).

1. Introduction [1]

Stocznia Szczecińska S.A. is one of the world’s shipbuilding leaders. Thanks to own restructurisation successful implementation [1], Quality Management System introducing acc. to ISO 9001, the system improvement through integration with Natural Environment Protection Management System and Work Health and Safety Management System as well as new Order Book - the Yard could successfully compete in this field.

Apart from management policy modification shipbuildings quality improvement was underlined. It is to be effected through introduction of Total Quality Management based on own customer oriented TQM model. The quality systems have gone through various stages in the Shipyard for 50 years and still keep evolving. They are aimed at meeting increasing customers’ requirements, personnel satisfaction and pride, friendly work environment and serious financial effects.

2. Quality System evolution in Stocznia Szczecińska S.A. [2, 3]

* Technical Control

Stocznia Szczecińska (Szczecin Shipyard) got involved in industrial production in 1948 when remaining German hull was launched and named Oliwa. Period 1948 - 1951 it was devoted to the shipyard reconstruction after World War II demolition. In the beginning of the 1950’s the Shipyard was given a big order book from the USSR for colliers. 18 August 1951 it was the day when the keel was laid for the very first of a long steamship series, 3200 DWT, named S/S
Czulym. Both shipbuilding and quality control was carried out under supervision of Soviet shipbuilders who also taught first Polish engineers. In 1951 within the shipyard’s structure, in the General Manager’s Division quality control department was founded. From 1951 to 1958 traditional quality control forms had been applied i.e. quality control inspection provided by surveyors from every department for each technological operation. Technical Inspectorate confirmed quality in the work sheets. In 1957 motor ships with 6000 DWT of Krynica type production started. In 1958 hull slipway Wulkan was started that allowed production of vessels over 10,000 DWT. The same year plant’s design office was upgraded into Szczecin Branch Design Office for Shipbuilding Industry. Then new, diversified ship designs were made there. Those newbuildings were highly regarded by the shipowners that resulted in export increase. In the 1960s shipyard’s production increased seriously as well. In the meantime technical personnel was educated and trained.

* Surveying
In 1959 new form of quality control i.e. surveying was introduced. To provide quality control directly working personnel and foremen were obliged to focus on observing quality requirements. Strict quality control by qualified surveyors was carried out for final poduction elements and systems apart from random on site inspections.

* DO-RO (ZERO-DEFECTS).
From 1968 - 1970 the started to look for better quality control concepts in form from fault free work called ,,DO-RO". Apart from that studies on complex solutions for quality control prolems were carried on.
The 1970s were not only fruitful with new investment projects and new ship type designing but also were those times when a background for hi tech personnel was given as the marine engineering department was opened in Szczecin Technical University.

* Polish Complex Quality Control System or Polish abbreviation [KSSJ]
In 1971 Polish Complex Quality Control System was formed that involved quality problems within production, preparation to production and after production stages. In order to ensure good management conditions for decision making and coordination seven teams dealing with quality were apointed that analyzed the resons of failures and errors and that drew the conclusions allowing failures and errors elimination. The following seven subsystems were formed and implemented,

* Surveying
* failures and errors elimination
* quality interventioning policy
* guarantee data
* evaluation of manufacturing
* evaluation of suppliers
* evaluation of storage and warehouses

Quality inspectorate role was specified. It is worth saying that few companies in Poland introduced KSSJ only and that implementation of the system was very diversified. As a matter of fact Shipyard’s KSSJ had been modified in 1998 and 1984 considering modifications resulting from the Parliamentary Bill On Quality of Objects, Products and Construction Services... of 1979 and from management system of the Shipyard and other changes basing on electronic data processing.
*Polish Complex Quality Control System and Quality Calculations*

In 1987 Stocznia Szczecińska S.A. made an agreement with the Ministry of Machinery and Steel Industry Product Quality Research Centre ZETOM for providing researches modifying recent Polish Complex Quality Control System into Polish Complex Quality Control System and Quality Calculations abbreviated SKSJ. Several new subsystems were invented incl. among many other ones supplies quality evaluation subsystem, welding quality evaluation subsystem, quality profitability calculation and many other. SKSJ subsystem work was carried on in many teams. It was completed when the system was implemented in the Shipyard in June 1990.

3. Quality Management System functioning acc. to ISO 9001

[2, 3, 4, 5, 6]

Every shipyard in the world including ours must gain and defend its position in the very competitive shipbuilding market. The shipowners’ demands must be met not only those referring to the ships’ specific technical parameters but also the demand the vessels to be manufactured at the highest standard condition of work with quality control strictly respected. We mean, in our Shipyard as quality: the compliance with international quality standards, our customer’s full satisfaction, obtained thanks to meting the customer’s requirements and expectations specified in the contract, satisfactory price and strict shipbuilding timetable as well as the highest standard of the product itself. As the customers all over the world demand from their suppliers to introduce QM Systems in their companies corresponding to ISO 9000 such a challenge was made. It was realised that the process of introducing such a system requires a good work management in every stage of decision making in the company and spreading responsibility for every post, commencing with the general manager and ending with the most average employee. The QMS prepared in 1993 in and for the Shipyard basing on ISO 9001 standard was verified through certification audition. The audition was carried out by Germanischer Lloyd Certification from Hamburg (Germany). As a matter of fact the auditors were astonished by the high standard of QMS documentation preparation. In the result of Germanischer Lloyd Certification Stocznia Szczecińska S.A. was awarded the QMS Certificate by Germanischer Lloyd Certification from Hamburg (Germany) on compliance with ISO 9001 on 10 November 1993. The certification covered „shipbuilding, machinery and steel construction”

Shipyard’s success was evident as Stocznia Szczecińska S.A., was the very first Polish shipyard placed in the world listing of QMS certified companies. In 1993 it was only three shipyards in the world that were ISO 9000 series certified. (Certificates on compliance with ISO 9002). The following years 1994 - 1997 it was a period when the QMS was being improved in the Shipyard. That also meant wider influence range on the Shipyard’s subcontractors resulting from requirement of introducing QMS for them as the Shipard’s partners standards complying with ISO 9000. The system improvement was needed because the Shipyard management system as well as QMS documentation required changes that on the other hand needed corresponding modifications in applying and
changing QMS documentation. QMS new procedures were introduced incl. changes in instrumentation and metrology as well as in QMS calculations. Improvements and corrections were also implemented after numerous audits, both inside the company and those provided by auditors from outside. In the meantime QMS Book was being updated and reedited. To run the QMS needed not only cost increase as documentation was to be updated but also required auditors to be trained. To meet this requirement several courses were run for the auditors both for those carrying auditing inside the company and those regarded as leading auditors. The training courses were run by Renaissance Technology Group, incl. lecturers from Quality Management International (Great Britain) and by the Shipyard owned „ERISON” limited company, employing lecturers from Poznań Technical University. As it has been already mentioned influence on the subcontractors was not limited to certification only, There was also another condition, vis. access for the Shipyard’s auditors who checked servicing and other companies in the form of so called customer audition. The customer audition was included for good into the system of subcontractor work provided on Shipyard’s premises improvement.

The range of audits gets extended whenever there are any modifications in internationally wide ISO 9000 series. The subcontractors are evaluated dependent on their (non-) certification in compliance with ISO 9000 series. Regular annual checking audits for QMS provided by Germanischer Lloyd in Stocznia Szczecińska S.A displayed few discrepancies (from 7 to 2) that were revised during the audit inspection. That means as Germanischer Lloyd auditors put it that the system works well and was popularised among the Shipyard personnel. That means also that the crew approach toward keeping up with quality requirements was understood well and that has been recognised by the Shipowners who respect high newbuilding quality.

In 1966 a double certification audit was run in Stocznia Szczecińska S.A for ISO 9001 QMS. Germanischer Lloyd audited the yard for renewing ISO 9001 certification for next three years. Another certifying institution running audit here was the Polish Centre for Research and Certification. The audit’s results: Two discrepancies from the standard that were revised within a week. Such a minimum number of discrepancies discovered through very severe audit inspection gives a good picture of a good working QM system in our Shipyard. Our experience gained during the system implementation are shared with the suppliers and subcontractors whenever they are evaluated by our auditors.

The International Certification Network (IQNet) membership received in 1997 was followed by the next certification document, i.e. Polish Centre for Research and Certification, abbreviated PCBC in Polish confirming PCBC certificate is equal to IQNet certificates.

In the result of work commenced as early as in 1996 that focused on Shipyard’s reliability in the Shipowners’ eyes as far as metrology / instrumentation is concerned many quality procedures had been introduced and the Lab Plant Quality Book based on EN 45000. Considering quality system improvement several steps were taken to improve work health and work safety and the Yard’s image as far as natural environment protection policy is concerned. Step by step
project was prepared and implemented despite high cost taking special care esp. of production environment and the Shipyard surrounding area. QMS procedures were introduces that considered aspects of such industrial activity. Development of quality-related systems in Stocznia Szczecińska S.A was displayed in Fig. 1

**Fig. 1 Development of quality-related systems in Stocznia Szczecińska S.A.**

### 4. Management System Integration [6]

In 1997 several projects were started that dealt with further improvement of QMS meeting the worldwide trends approach to develop ISO 9000 series standards. It was taken into consideration that further ISO standards were written dealing with natural environment protection and in many countries also with health and safety at work. A model for integrated management was chosen that regards QMS as dominating system. The model was assumed to have management systems (and their documentation references) put in order into the Stocznia Szczecińska S.A. Quality Book (Guide) (abbrev. in Polish KJ) as required by ISO 9001,

- KJ for Natural Environment Management, completes in details it. 4.9
- KJ for Health and Safety at work, completes in details it. 4.9
- KJ for Lab Plants, based on European EN 45000 standard, completes in details it. 4.10

The same year Health and Safety Management as well Natural Environment Protection were approved and implemented as the company’s policy. And that was reflected in the two following Books (Guides).

- BS 8800 - A Guide to Occupational Health and Safety Management Systems
- ISO 14001 - A Guide to Natural Environment Protection

Documentation for both systems comes from one resources centre and the subject problems are solved altogether with experts dealing directly with these problems.
5. Preparation for introducing Total Quality Management System - TQM [5, 6, 7, 8, 9, 10, 11]

When talking about TOTAL QUALITY MANAGEMENT some definitions should be given beforehand to make the TOTAL QUALITY MANAGEMENT problems clearly understood.

TOTAL QUALITY MANAGEMENT is effective integration of personnel on all levels in order to improve products and services that meet increasing customers’ demand.

TOTAL QUALITY MANAGEMENTS is the philosophy of management and practices implemented to couple human and material resources of a specific institution in order to put into life the institution’s aims [7].

These definitions let us conclude that TOTAL QUALITY MANAGEMENT implementation is not easy and requires many efforts, is time consuming and first of all is dependable on high conscience and knowledge of the employees.

The way that has been presented so far points visibly that the quality systems development is permanent. As early as in 1993 training courses were started improving management, among many Controlling. Material supplies as influencing production timing were also improved. The following years Shipyard employees were trained in English both in Szczecin and in England in order to improve communication between our employees and our partners - shipowners, classifying societies, overseas suppliers. From 1993 - 1999 QMS & EMS and OH&SM company’s auditor title was given to 157 people, and 25 people were awarded with the leading auditor title (incl. Natural Environment Protection audition). Leading auditors courses were run by Quality Management International Ltd., U.K. As far as Controlling courses around from 1993 to 1996 are concerned executives were trained (62 people) and foremen (274 people). Regular Controlling courses were carried out by Consulting and Training Management Centre from Gdańsk. The Controlling courses focused on effective financial management in relation to quality cost calculation(s) and were attended by 32 people. Natural Environment Protection Management System has been worked out in the Shipyard as a part of ISO 9001 for five years. In 1996 a some employees were trained for applying statistical methods in SPC processes inspection. In 1996 Natural Environment Protection Management System preparational work for introducing the Natural Environment Protection Management System acc. to ISO 14000 was started. Several papers were prepared as studies, preliminary projects, drafts and analytical studies. Company named ERISON trained 21 people, employing Bureau Veritas QI lecturers for Review and evaluation of Natural Environment Protection.

In 1999 several people (104) attended seminars concerning ISO 14000 and BS 8800 introduction in the Shipyard run by companies: Lloyd Register Quality Assurance and The British Standards Institute Services.

SIMONS Ltd. who introduced Total Quality Management problem as it is introduced in Canada and the U.S. Another training focused on introducing Total Quality Management in the Yard addressed to the Board of Executives and procurents was provided by Dr K. Krukowski. In 1997 three executives attended a course in complex quality and production management arranged by the Polish Quality and Production Management Center from Loyola Marymount University, Los Angeles. Then those trained employees run a course in 1998 for management and executives. Formal step toward Total Quality Management introduction in the plant was the General Manager’s directive entitled Preparations for TQM Introduction of April 1996. The same year Stocznia Szczecińska S.A. altogether with Poznań Technical University’s Management Engineering Institute and Szczecin Technical University’s Shipbuilding Institute proposed a motion for KBN (Polish Ministry for Scientific Researches) focused on the project entitled Total Quality Management in an industrial and financial group integrated by Stocznia Szczecińska S.A.. The project was approved KBN approved in 1997. In order to implement the project several teams were formed involved in different Total Quality Management subjects. The first stage focused on the management systems' anlysis for Stocznia Szczecińska S.A. and some other shipbuilding industry companies, incl. Stoczni Porta-Odra, TOWIMOR, Toruń. Analyses results allowed to select a right Total Quality Management model that could be applied to a specific company. Considering alternative Total Quality Management models a designing team put attention to different concepts. One of the considered Total Quality Management concepts was one based on „Total Quality Management- BS 7850” [7] covering as follows, 

* full awareness * own and third party clients' satisfaction * budgeting * full personnel commitment * benchmarking of achievements in all the processes * permanent training * problem recognition * connecting individual approach and company's aims * personal responsibility * personnel development 

Quality Award, Malcolm Baldrige Award [8] criteria were analysed, as defined in 7 modules: 

* Leadership * Information and Analyses * Strategic Quality Planning * Human Resource Utilization * Quality Assurance of Products and Services * Quality Results * Customer Satisfaction. 

Another TQM concept was also considered, resulting from 9 module award assessment both from the Polish Quality Award [9] and European Quality Award [10], viz., 


Berlin TQM model, basing on European Quality Award was also taken into consideration. As soon as analysis and assessment of the introductory stage for Stocznia Szczecińska S.A. were completed TQM model was being designed. Studies on diversified TQM models allowed to work upon own model suitable for Stocznia Szczecińska S.A. that apart from financial and social effects gave a chance to apply for prestigious TQM awards. It seems quite probable that this model can be applied to other companies when simplified and considering specific problem. TQM Model structure adapted various systems of
management, different methods, ways and managing techniques, as needed for the Shipyard in the process of improving management on site. Projects ran by several designing teams, joined by foresaid higher education researchers and Stocznia Szczecińska S.A. employees was fruitful and allowed to implement below listed projects:

* TQM Model adapted for Stocznia Szczecińska S.A. *
* Methods for implementing TQM *
* Assessment for effective TQM introduction in Stocznia Szczecińska S.A. *
* Assessing executives and employees *
* Managing selected processes in Stocznia Szczecińska S.A. *
* TQM Research and Training Centre *

Elaborated by one of several teams (authors: Jan. Dmochowski, Janusz Malewski, Kazimierz Krukowski) – model TQM for Stocznia Szczecińska S.A. [11] as defined in 13 modules:

* Leadership *
* People and Human factors *
* Policy and Strategy *
* Management Systems *
* Quality Teams and Quality Circle *
* Prevention Actions *
* Quality Methods *
* Visualisation and Promotion *
* Processes *
* Parameters *
* Self-assessment *
* Results *
* Research & Training Centre *

The TQM model for Stocznia Szczecińska S.A. is displayed in photo 1. Foresaid work allowed to gather serious resources for TQM studies that resulted in scientific conference organised by Stocznia Szczecińska S.A. with full assistance from Poznań and Szczecin Technical Universities as well as Polish Ergonomics Association, entitled From ISO 9000 implementation to TQM. The conference was held in March 1998 at Międzyzdroje. The conference papers were published in Poznań Technical University journal Nr. 22/ 1998. Next conference was in March 1999. Conference material were published in Poznań Techn. Univ. Scientic Paper No. 25 / 1999 and Szczecin Techn. University’s No.1. Final project implementing body (Management Engineering Institute from Poznań Technical University) provided the following tasks in 1997 and 1998,

Stage 1 : Studying Present Quality Management Systems in Stocznia Szczecińska S.A.

- research subject criteria were established, and research outlines as well as research schedule considering specific type of the company studied,
- polls forms were made that were basis for providing studies for Quality Management Systems in Stocznia Szczecińska S.A., Porta Odra - Szczecin and TZUO Towimor - Toruń.
- Polls results were published for the forelisted companies and concept for 2nd Stage.

It will have the further Total Quality Management concepts presented basing on the 2nd stage results as foresaid and will conclude solutions following diversified quality problems.

Stage 2 : Total Quality Management System preparation and introducing in Stocznia Szczecińska S.A.

The following items were prepared,

* Total Quality Management model adapted for Stocznia Szczecińska S.A conditions *
* Total Quality Management method of introduction for Stocznia Szczecińska S.A. *
* Evaluation for executives and employees *
* Selective process management for Stocznia Szczecińska S.A *
* Total Quality Management Research and Training Centre
Stage 3 (1999 and 2000 yrs): Total Quality Management System introduction will cover among many,

- finding resources both physical and human ones required to implement Total Quality Management
- foundation of the Research and Training Centre (or an organization running courses and training for the people who take part in Total Quality Management forming
- personnel training
- Total Quality Management prepared model introduction
- Self-assessment.

TQM introduction in the Shipyard will cover as follows, gathering suitable resources and arranging personnel and organisation for implementing this project. Making the TQM Research and Training Centre (or an institution running training courses on permanent basis for those participating in TQM project). Next step it is implementation of approved TQM model and the model's self-assessment. As soon as planned aims are effected Stocznia Szczecińska will apply for the award from European Foundation for Quality Management.

Photo 1. Model TQM for Stocznia Szczecińska S.A. (Shipyard) [11]
REFERENCES


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