

## Design for Environment Model through Total Quality Management

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**ABSTRACT** Total Quality Management (TQM) Is Based On A Number Ideas And Concepts. It Means Thinking About Quality In Terms Of All Functions Of The Enterprise And Is A Start – To – Finish Process That Integrates Interrelated Functions At All Levels. The Problem Appears By Defining The “Total Quality” Term. In This Paper, Quality Is Not Only Meeting Customer’s Requirements, Formal And Informal, At Lowest Cost, First Time And Every Time, It Includes Also The Requirements Of The Environment. This Requires The Enlargement Of Traditional TQM Concepts And The Creation Of A New Model And Framework For Environmentally Conscious TQM (ECTQM) Where TQM Is Within “Design For Environment”.

**KEYWORDS:** Quality, Total Quality Management, Design For Environment, Environmental Management System, Sustainability.

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### I. INTRODUCTION

Total Quality Management Is The Integration Of All Functions And Processes Within An Organization In Order To Achieve Continuous Improvement [1]. Oakland (1993), Defines TQM As “An Approach To Improving The Competitiveness, Effectiveness And Flexibility Of A Whole Organization” [2]. The Core Idea Of Oakland Approach Is To Focus On The Processes, Identifying Internal And External Customer Needs [3]. What If We Consider The Environment As A Customer With Special Needs And Requirements?

#### Current Approaches

Organizations Of All Kind Are Increasingly Concerned To Achieve And Demonstrate Sound Environmental Performance. Many Companies Have Undertaken Environmental Audits To Assess Their Environmental Performance. For The Effectiveness Of Such Activity, The Later Should Be Conducted Within A Structured Management System, Which Is In Turn Integrated With The Management Activities Dealing With All Aspects Of Desired Environmental Performance [4].

Moreover, In Order To Reduce Environmental Loads, Many Companies Have Introduced Environmental Management Systems EMS Into The Whole Body Of Their Branches. Typically All Activities Towards Friendliness In A Company Are Centered On The EMS. Many Companies Are Paying An Extra Cost To Compensate For The Environmental Impacts Of Their Products Which May Cover The Whole Life Cycle Of Their Products. For This Reason The Concept Of “Life Cycle Thinking” Should Be Introduced Into The Company.

#### Disadvantages Of Current Approaches

Organizations Should Establish Procedures For Setting Environmental Policy And Objectives, And Achieving Compliance To Them. Environmental Policy Should Be Designed To Place Emphasis On The Prevention Of Adverse Environmental Effects Rather Than On Detection After Occurrence. It Should Also Identify And Assess The Environmental Effects Arising From The Organization’s Existing Or Proposed Activities, Products, Or Services And From Incidents, Accidents, And Potential Emergency Situations. The System Must Identify The Regulatory Requirements, Priorities And Pertinent Environmental Objectives And Targets. It Needs Also To Facilitate Planning, Controlling, Monitoring, Auditing And Reviewing Activities To Ensure That The Policy Is Compiled With, That It Remains Relevant, And That Is Capable Of Evolution To Suit Changing Circumstances.

A Study Released By Chris Gruner Et Al [5], Revealed A Missing Link In Today’s Companies Between EMS And “Design For Environment” (DFE). One Major Result Of The Study Was That, There Is No Just A Very Link Between The EMS And Product Development Criteria. The Study Revealed Also That Companies’ Internal Standards And Guidelines Seem To Be A Good Instrument To Strengthen The Link

Between EMS And Product Development But, These Can Not Guarantee A Good Total Quality Management Within Design For Environment Concept.

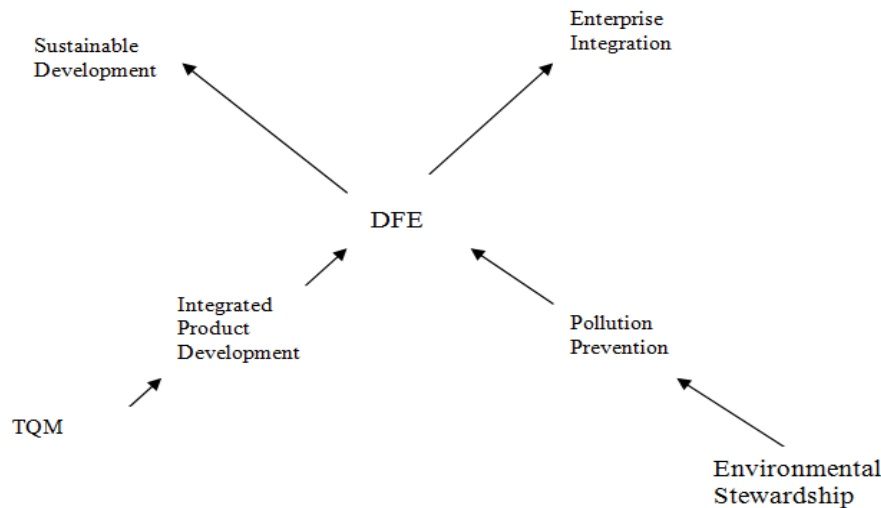
## II. NEW APPROACH FOR TQM WITHIN DESIGN FOR ENVIRONMENT

### 1- Design For Environment

DFE Is Defined Here As Systematic Consideration Of Design Performance With Respect To Environmental, Health And Safety Objectives Over The Full Product And Process Life Cycles. DFE Represents A Conceptual Crossroads – It Is At The Convergence Of Two Thrusts That Are Transforming The Nature Of Manufacturing Throughout The World. Fig.1. These Two Thrusts Are Enterprise Integration And Sustainable Development [7]. DFE Represents A Way To Achieve Sustainability While Seeking Competitive Advantage.

### 2 – DFE Practices

The Following Is A Compilation Of DFE Guidelines Which Should Be Practiced By Manufacturing Firms In A Variety Of Industries. While It Is Not Comprehensive, It Illustrates The Range Of Practices That May Be Considered In DFE. To Be Truly Useful To A Particular Company And Product Team, These Types Of Guidelines Need To Be Converted From The General Statements Listed Below To More Specific Approaches That Are Applicable To The Products In Question. Table1.



**Fig.1. DFE – The Conceptual Crossroads**

Design For Recovery And Reuse (DFRR) Design For Disassembly (DFDIS) Design For Waste Minimization (DFWM) Design For Reparability (DRS) Design For Energy Conservation (DFEC) Design For Material Conservation (DFMC) Design For Chronic Risk Reduction (DFCCR) Design For Accident Prevention (DFAP)
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**Table1. Design For Environment Concepts.**

## III. ASSUMPTIONS

Product Development Is Achieved In A Concurrent Engineering Environment, Which Brings Many Benefits To The Industries. Quality Function Deployment QFD Is Used By The Industries To Achieve Customer Satisfaction. QFD Is Demonstrated To Be A Tool For TQM [6] Fig 2.

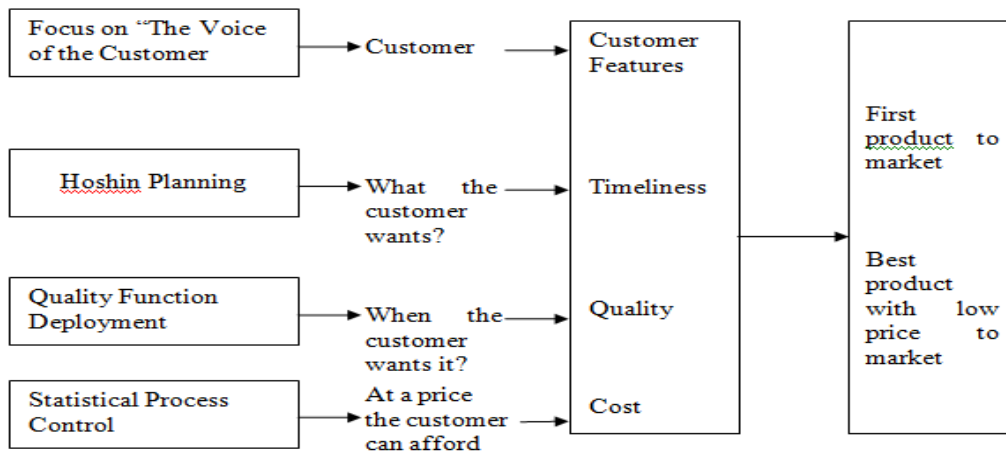


Fig.2. QFD Within TQM

**A Model For TQM Within DFE**

The Model Shown In Figure 3 Requires Filling In The Gap Between TQM And DFE. To Achieve This Issue, Some Organizational Changes And Appropriate Methods For DFE Implementation Are Required. The Model Is Based On The Construction Of Links Between DFE Windows And TQM Existing System In The Company. This Requires That Company’s Internal Standards And Guidelines Have To Be Combined With Organizational Changes In Product Development [5].

The Organizational Changes Can Include A Company Internal “Environmental Help Desk” Or An “Environmental Champion” Within The Design Department. Environmental Experts Can Perform Life Cycle Assessment Studies Together With Designers. Environmental Checks And Releases Should Also Be Included Into The Company Specific Product Development Process. Besides The Organizational Measures, The Guidelines Have To Utilize Appropriate Methods And Instruments For DFE. Future Methodologies Have To Minimize The Efforts (Time, Cost...) Needed For DFE Application And Being Applicable At The Early Stages Of Product Design.

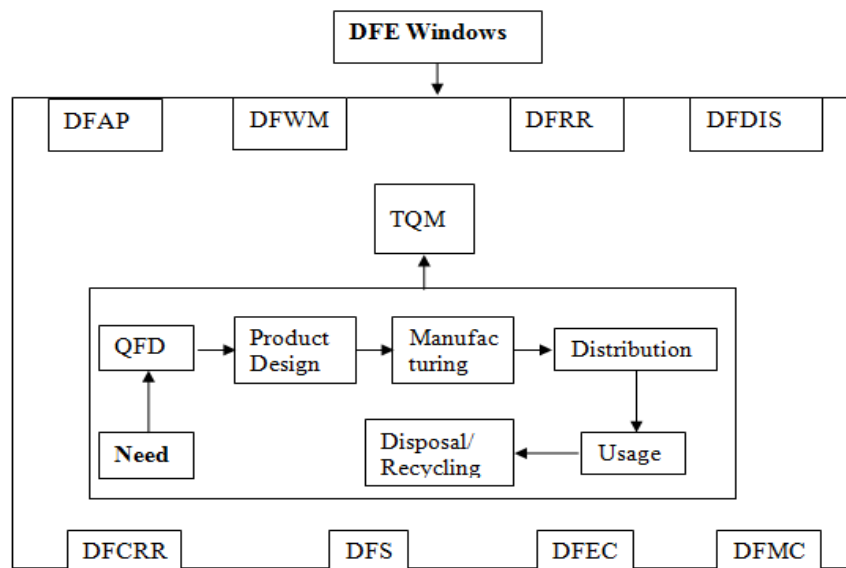


Fig.3. TQM within DFE Model

**IV. CONCLUSION**

Global Companies Are Moving Aggressively To Integrate Environmentally Conscious Technologies And Products Into Their Strategies For Future Competitiveness. To Achieve This Activity, DFE Should Become The Main Objective Of The Manufacturing Industries. The Suggested Model “TQM Within DFE” Traces The Links Between Quality Management Operations And DFE Windows. DFE Becomes The Driving Factor For TQM. The Establishment Of “Environmental Help Desk”, “Environmental Champion”, Employment Of

Environmental Experts And Integration Of Environmental And Product Design Departments Can Help To Make TQM A Tool For DFE.

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