

Design for X – design for excellence

REVIEWERS:

Prof. Jerzy Nowacki

(West Pomeranian University of Technology – Szczecin)

Prof. Klaudiusz Lenik

(Lublin University of Technology – Lublin)

ASSOCIATE EDITORS:

Dr Janusz Madejski

(Silesian University of Technology - Gliwice)

Ms Justyna Hajduczek, MSc

(Silesian University of Technology - Gliwice)

SOURCE OF FUNDING:

The monograph has been prepared in the framework of the employment of Professor G.F. Batalha as a visiting professor in the Institute of Engineering Materials and Biomaterials, the Faculty of Mechanical Engineering, the Silesian University of Technology in relation to the project POKL.04.01.01-00-003/09-00 entitled "Opening and development of engineering and PhD studies in the field of nanotechnology and materials science" INFONANO, co-founded by the European Union from financial resources of European Social Fund and headed by Prof. L.A. Dobrzański.







ISSN 2083-5191 ISBN 978-83-63553-03-6 EAN 9788363553036



Contents

Abstract	5
Preface	7
1. Design for excellence – quality control & DFX	8
1.1. Introduction	8
1.2. CIM and Lean Six Sigma	12
1.3. Quality System case	18
1.4. Results and discussions	27
1.5. Summary	28
2. Concurrent engineering and DFMA/DFX on the developmen	nt
of automotive components	30
2.1. Introduction	30
2.2. Concurrent engineering	32
2.3. DFMA and DFX tools for concurrent engineering	33
2.4. Summary	50
3. Design for assembly case: automotive fuel intake cover	52
3.1. Introduction	52
3.2. The design process	52
3.3. Case study	59
3.4. DFA analysis of the fuel cover	61
3.5. Analysis of the secondary parts	63
3.6. Process analysis: improvement over the existing processes	
3.7. Comparative Analysis	65
3.8. Summary	66
4. Spot weld fatigue durability performance evaluation through	jh
the use of Finite Elements Analysis and Design for Life Cycle	68
4.1. Introduction	68
4.2. Automotive Body in White (BIW) and its welding process	
of assembly	68
4.3. Electric Resistance Spot Welding process (ERSW)	71
4.4. ERSW spot weld fatigue properties	72
4.5. ERSW – spot weld analysis by Computer Aided	
Engineering (CAE)	
4.6. Durability performance analysis by CAE	
4.7. Conclusions	85



Design for X – design for excellence

Contents

5.	Tow	ards a design for ecological management and product	
	sust	ainability – European and Brazilian approaches	86
	5.1.	Introduction	86
	5.2.	EMS conforming to requirements of the ISO 14001	87
	5.3.	European Ecological Management & Audit System (EMAS)	88
	5.4.	Differences & similarities between ISO 14001 & EMAS	89
	5.5.	Role of EMS in search procedures for sustainable	
		technology	90
	5.6.	Technology acting to serve the environment	92
	5.7.	Conclusions	93
6.	Mate	erials Selection and the DFX methodology	
	for p	product developments	95
	6.1.	Introduction	95
	6.2.	Types of design and the materials and technology	
		life cycle	95
	6.3.	DFMA methodology, DFX and PLM product development	98
	6.4.	Concurrent Engineering	98
	6.5.	DFM & DFA 1	01
	6.6.	DFX – DFE – Design for environment 1	04
	6.7.	PLM – Product Life Cycle Management 1	10
	6.8.	Conclusion 1	11
Li	terat	ure 1	112