

1	Introduction	1
1.1	Advances in Metal Forming	1
1.2	Deep Drawing Process	2
1.2.1	Influencing Factors	3
1.3	Development in Rolling	4
1.3.1	Classification of Rolling Processes	5
1.4	Advancement in Extrusion Process	5
1.5	An Overview of Bending Process	7
1.6	Organisation of the Book	8
	Reference	10
2	Enhancement in Expert System	11
2.1	Expert Systems and Its Applications	11
2.2	Deep Drawing Process	15
2.3	Recent Trends in Rolling	17
2.4	Development in Extrusion Process	19
2.5	Review of Bending Process	21
2.6	Need of the Expert System	22
2.7	Objectives	24
	References	24
3	Fundamentals of Expert System	31
3.1	Introduction	31
3.1.1	Web-Based Expert System	32
3.1.2	Knowledge Based Expert Systems	33
3.1.3	Limitations of Expert Systems	34
3.1.4	Proposed Hierarchical Structure	34
3.2	Background of Web Based Expert System	35
3.2.1	Expert Systems	35
3.2.2	Rationale for a Web-Based System	36
3.2.3	Web Manufacturing	37

3.2.4	System Architecture	37
3.2.5	Active Platform Concept	38
3.2.6	Active Server, Active Client and ActiveX Active Client	39
4	Design of Web Based Expert System	41
4.1	Introduction	41
4.2	Java Servlets	41
4.3	Java Servlet Framework	42
4.3.1	HTTP Request	42
4.3.2	HTTP Response	43
4.4	Application Logic and Content Generation	43
4.5	Session Tracking and State Management.	44
4.6	Web Based Expert System Development Issues	44
4.6.1	Servlet Management	44
4.7	Architecture of Expert System	45
4.7.1	Single-Tier Architecture	45
4.7.2	Two-Tier Architecture	46
4.7.3	Three-Tier Architecture	46
4.8	Role of Servlets	47
4.8.1	Databases	48
4.8.2	Application Logic	48
4.9	Basics of Web Based Expert System	50
4.9.1	Basic Terms and Concepts	50
4.9.2	Web Browser	50
4.9.3	The Web Server	51
4.9.4	Internet Protocols	51
4.9.5	Uniform Resource Locators	51
4.9.6	Hypertext Markup Language and Hyperlinks	52
4.9.7	Extension to Standard Web Browser Functionality.	52
4.10	Building of Web Based Expert System	53
4.10.1	Tools Selection	53
5	Implementation of Web Based Expert System for Deep Drawing Process	57
5.1	Introduction	57
5.2	Shape Classified Geometries	57
5.2.1	Deep Drawing Process	58
5.2.2	Blank Size	59
5.2.3	Draw Ratio.	62
5.2.4	Radius of Draw Dies	63
5.2.5	Punch Radius	63
5.2.6	Draw Clearance	63

5.3	Formulation of Rules for Deep Drawing Process	63
5.3.1	Failures in the Deep Drawing	64
6	Case Studies and Discussion	67
6.1	Introduction	67
6.2	Prediction of Forming Parameters in Deep Drawing Process	67
7	Summary and Future Scope	75
7.1	Summary	76
7.2	Knowledge Based Expert System.	76
7.3	Limitation of Expert Systems	77
7.4	Knowledge Acquisition	78
7.5	Future Research Direction.	79
	Appendix A.	81
	Appendix B.	87
	Index	115