

Contents

1	Introduction	1
	Review of the Chapters	1
2	Assembly Systems	7
	Introduction	7
	History of Assembly Lines	8
	Type of Assembly Systems	11
3	Some Fundamentals	15
	Introduction	15
	Work Elements	15
	Precedence Diagram	16
	Unit Time	16
	Shift Time	17
	Shift Schedule	17
	Number of Operators	17
	Cycle Time	17
	Average Operator Time	18
	Balance Delay	18
	Efficiency Ratio	18
	Line Balance	19
	Operator Times	19
	Effective Cycle Time	20
	Effective Balance Delay	20
	Bill of Material	20
	Part Requirements	21
	Stations and Operators	21
	Main Line, Subassembly Lines, and Labor Groups	22
	Parallel Stations	23
	Summary	23

4	Assembly Planning	25
	Introduction	25
	Single Model Lines	25
	Labor Groups	26
	Mixed Model Lines	26
	Single Model Assembly with One Labor Group	27
	Single Model Assembly with Five Labor Groups	29
	Mixed Model Make-to-Stock Assembly	30
	Mixed Model Make-to-Stock Assembly with 2 Labor Groups	34
	Summary	34
5	Inventory Requirements	37
	Introduction	37
	Single Model Assembly	37
	Mixed Model Make-to-Stock Assembly	38
	Mixed Model Make-to-Order Assembly	40
	When Same Part for all Options of Feature f	40
	When Different Part for Each Option of Feature f	41
	Inventory Replenishments	42
	Part Data	42
	Order Point and Order Level	43
	Buy Quantity	43
	Summary	45
6	Single Model Assembly	47
	Introduction	47
	Number of Operators	48
	Some Measures	48
	Predecessor Elements	48
	Precedence Diagram	50
	Line Balancing	50
	Effective Line Measures	52
	Bill-of-Material Connection	52
	Shift Inventory Requirements	53
	Sequence of the Elements and Parts	54
	Just-in-Time Replenishments	54
	Summary	56
7	Mixed Model Make-to-Stock Assembly	57
	Introduction	57
	Precedence Diagram	58
	Mixed Model Shift Schedule	59
	Shift Element Times	59
	Number of Stations	61

Mixed Model Line Balancing	61
Operator Model Times	61
Summary	68
8 Mixed Model Make-to-Order Assembly	69
Introduction	69
Make-to-Order Assembly	69
Precedence Diagram	70
Features and Options	70
Element Shift Times	72
Number of Stations	73
Efficiency	74
Line Balancing	74
The Shift Job Schedule	74
Shift Count of Feature Options	76
Make-to-Order Sequencing Algorithm	76
Make-to-Order Sequence	79
Job Replacements	82
Make-to-Order Replacement Algorithm	82
Drop Job 23	83
Drop Job 23 and Replace with Job 66	83
Bill-of-Material	86
Part Requirements	86
Summary	87
9 Postponement Assembly	89
Introduction	89
Work Elements	90
Features and Options	91
Bill-of-Material	91
No Postponement (Make-to-Order Assembly)	91
Shift Element Times	92
Line Balancing	92
Line Sequencing	93
Shift Part Requirements	94
Full Postponement (Single Model Assembly)	95
Work Elements	96
Shift Schedule	96
Line Balancing	96
Shift Part Requirements	98
Partial Postponement (Make-to-Stock Assembly)	98
Work Elements	100
Shift Assembly Schedule	101
Shift Element Times	101

Line Balancing	101
Line Sequencing	102
Shift Part Requirements	103
Summary	104
10 One Station Assembly	105
Introduction	105
Inventory and Requirement Data by Model	105
Days-Supply by Model.	106
Days-Supply for All Models	106
Adjusted Days-Supply by Model	107
Build Quantity by Model	107
Build Schedule of Model at Station	108
Bill-of-Material	109
Part Requirements by Station	109
Part Requirement at Station	109
Plant Reusable Mold Inventory	111
Queuing Computations	111
Summary	114
11 Similarity Index	115
Introduction	115
Three Scenarios.	115
Model Sets	116
Utilization Index	116
Similarity Index	117
Scenario 1	117
Scenario 2	118
Scenario 3	119
Example of 100 Elements and Six Models	120
Summary	123
12 Learning Curves	125
Introduction	125
Single Model Assembly	126
Learning Limit	127
Estimating the Learning Rate	133
Mixed Model Assembly	133
Two Model Learning Curve	133
Time for First Unit in Learning.	134
Unique and Common Elements.	134
Repetitions	134
Mixed Model Learning Curve	135
Three Model Learning Curve	136

Contents	xiii
M-Model Learning Curve	138
Summary	140
Bibliography	141
Index	143

Assembly Line Planning and Control

Thomopoulos, N.T.

2014, XVI, 145 p. 10 illus. in color., Hardcover

ISBN: 978-3-319-01398-5