

Contents

List of Tables	XI
List of Figures	XV
List of Abbreviations	XVII
List of Notation	XIX
1 Introduction	1
1.1 Motivation	1
1.2 Outline of the thesis	3
2 Chemical production processes	5
2.1 Characterization of chemical production processes	7
2.2 Modelling chemical production processes	14
2.2.1 Chemical kinetics	15
2.2.2 Modelling & simulation of chemical processes	18
2.2.3 Process identification & control	22
2.3 Time series methodology	25
2.3.1 ARIMA models	25
2.3.2 GARCH models	29
2.3.3 Multivariate time series models	31
2.3.4 Data preparation, model specification and residual checking	33
3 Distribution planning in chemical industry logistics	51
3.1 Characteristics of chemical industry logistics	52
3.2 Planning problems for pipeline operations	54
3.2.1 Technical and organizational prerequisites	54
3.2.2 Single-product pipelines	56
3.2.3 Multi-product pipelines	67
3.2.3.1 Batch flow pipelines	68
3.2.3.2 Batch split pipelines	81
3.2.3.3 Multi-source pipeline systems	85
3.3 Planning problems for rail operations	87

3.3.1	Technical and organizational prerequisites	87
3.3.2	A short-term rail transportation problem	90
3.3.2.1	Problem formulation	90
3.3.2.2	Components for modelling rail transports	91
3.3.2.3	Components for modelling turnover processes	92
3.3.2.4	Components for modelling the objective function	93
3.3.2.5	Mathematical model	94
3.4	Planning problems for ship operations	108
3.4.1	Technical and organizational prerequisites	108
3.4.2	Maritime inventory routing problems	110
3.4.3	Maritime inventory shipping problems	113
4	Integrated planning of chemical supply chains	123
4.1	Literature review	125
4.2	Sources and effects of uncertainty in chemical industry	141
4.3	A framework for simulation-based integrated planning of supply chains in chemical industry	150
4.3.1	Conceptual modelling & data analysis	151
4.3.2	Components of chemical supply chain simulation models	159
4.3.3	Verification & validation	167
4.3.4	Planning of simulation experiments	170
4.3.4.1	Performance measures in (chemical) supply chain models .	172
4.3.4.2	Experimental designs	175
4.3.4.3	Simulation optimization	185
4.3.5	Decision support	196
5	Conclusion and final remarks	203
	Bibliography	207
	Appendix	229



<http://www.springer.com/978-3-658-08432-5>

Integrated Supply Chain Planning in Chemical Industry

Potentials of Simulation in Network Planning

Kirschstein, Th.

2015, XXII, 245 p. 67 illus., Softcover

ISBN: 978-3-658-08432-5