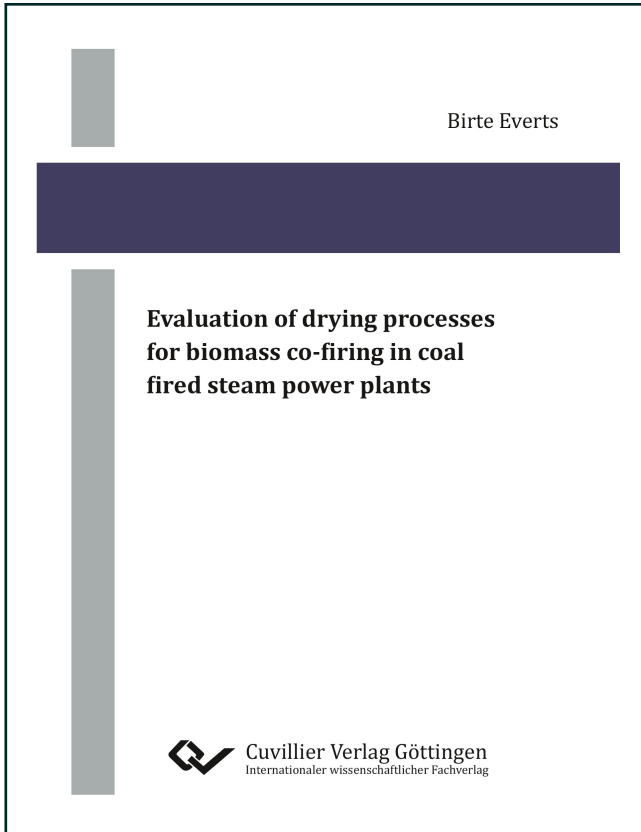




Birte Everts (Autor)

Evaluation of drying processes for biomass co-firing in coal fired steam power plants



<https://cuvillier.de/de/shop/publications/7434>

Copyright:

Cuvillier Verlag, Inhaberin Annette Jentsch-Cuvillier, Nonnenstieg 8, 37075 Göttingen,
Germany

Telefon: +49 (0)551 54724-0, E-Mail: info@cuvillier.de, Website: <https://cuvillier.de>



CONTENTS

Contents	I
List of Figures	III
List of Tables	IX
Abbreviations and symbols	X
1 Introduction	1
1.1 Background	1
1.2 Aim and scope	2
1.3 Methodology	3
2 Co-firing biomass with coal	5
2.1 Current Co-firing activities in power generation	6
2.2 Biomass fuel characteristics and resulting effects in the combustion system	8
2.3 Fuel supply and environmental aspects of biomass co-firing	13
3 Drying technologies	17
3.1 Requirements of the drying material and dryer selection.....	18
3.2 Indirect steam-tube dryer	20
3.3 Direct rotary dryer	22
4 Introduction of Considered drying scenarios	25
4.1 Definition of energy utilisation efficiency	26
5 Model development	31
5.1 Steam power plant for biomass co-firing	31
5.1.1 Power plant overall process modelling	31
5.1.2 Boiler modelling.....	35
5.2 Indirect steam-tube dryer	36
5.2.1 Dryer modelling	36
5.2.2 Integration into the power plant process	38
5.3 Direct rotary dryer	44
5.3.1 Dryer modelling	44
5.3.2 Stand-alone dryer	46



5.3.3	Integration of a direct rotary dryer into the power plant.....	47
6	Effects of biomass co-firing on the power generation process	49
6.1	Effects on the boiler	49
6.2	Effects on the overall process	55
7	Analysis of Drying scenarios	61
7.1	Scenario 1 – integrated on-site drying by an indirect steam-tube dryer	61
7.1.1	Scenario 1 _a – drying steam extracted from IP/LP crossover pipe	61
7.1.2	Scenario 1 _b – drying steam extracted from IP/LP crossover pipe and LP turbine.....	73
7.2	Scenario 2 – stand-alone drying by a direct rotary dryer	79
7.3	Scenario 3 – integrated on-site drying by a direct rotary dryer.....	84
7.4	Comparison of scenarios.....	90
7.4.1	Transport related CO ₂ emissions.....	91
7.4.2	Total resulting CO ₂ emissions.....	92
7.4.3	Overall energy utilisation efficiency.....	98
7.4.4	Alternative approach of comparison	100
7.4.5	Concluding evaluation of drying scenarios.....	101
8	Summary and conclusions	103
	References.....	107