Karl J. Thomé-Kozmiensky
Luciano Pelloni

WASTE MANAGEMENT

Volume 2

Waste Management • Recycling
Composting • Fermentation
Mechanical-Biological Treatment
Energy Recovery from Waste
Sewage Sludge Treatment



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WASTE MANAGEMENT, Volume 2
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Sewage Sludge Treatment
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Contents

Policy – Legislation – Economy

Implementation of the European Industrial Emissions Directive
Andrea Versteyl 3

Liability of BREF/BAT-Documents for Waste Incineration
Markus Gleis 9

The Polish National Waste Management Plan 2014
Beata B. Kłopotek 21

Recent Municipal Waste Management Legislation in Poland
Dominik Wałkowski 31

International Treaty Standards in Waste Management
Stefan Eder 43

Investments in Poland – General Requirements and Funding
Christian Schnell 55

The European Energy from Waste Market – Status and Perspectives
Jörg Zunft and Birgit Fröhlig 69

The Polish Market for Municipal Waste Affords High Potentials
Sandra Biering, Dirk Briese and Hilmar Westholm 77

The Recycling Market in Poland
Grzegorz Hoppe 81

Waste Management

Recycling and Waste Incineration – Not a Contradiction –
Karl J. Thomé-Kozmiensky 91

Resources and Energy Management Grow Together
Michael Jakuttis 111

Demand for MBT Installations in Poland for the Year 2020
Andrzej Jędrczak 123

The Role of Thermal Treatment in Integrated Waste Management Concepts
Oktay Tabasaran 133

The Role of Waste-to-Energy in Sustainable Waste Management
Ferdinand Kleppmann and Marta Gurin 145

Overview of the Polish Waste-to-Energy Projects and their Perspectives
Tadeusz Pająk 155

Significance of Landfills in Modern Waste Management
Johann Fellner 163

Planning

Road Map for the Implementation of Waste Management Plans
Luciano Pelloni 173

Experiences of a General Contractor in Turnkey Plant Construction
Christophe Cord'Homme, Stefano Costa and Hubert de Chefdebien 183

Waste Incineration

The Global WTERT Council and its Role in Advancing WTE Technologies
Efstratios Kalogirou and Nickolas J. Themelis 201

The International WTERT Council and WtERT Germany – International Network on Waste to Energy (WtE) –
Michael Jakuttis 209

Aspects of Layout Planning of Waste Incineration Plants and Solid Recovered Fuel Power Stations
Falko Weber 219

Incineration Technology for Municipal and Industrial Waste Described by Way of Executed Projects
Gert Riemenschneider and Walter Schäfers 233

Advanced Thermal Treatment Technologies for Waste – Present State of the Art –
Frans Lamers and Robert van Kessel 257

Integrated Waste Treatment including Residue Utilization
Andreas Richter 269

Better ROI and Lower Emissions – Smart Decisions Based on Energy Efficiency Facts Reduce the Emissions and Improve Your OPEX –
Albert Bossart 285

Innovative Concepts for Highly Efficient Energy-from-Waste Plants in the Netherlands
Gerhard Lohe 303

Heat Recovery in Waste to Energy Plants
Tomasz Dobrzycki, Jerzy Mirosław and Witold Stogniew 315

Waste Heat Recovery Using the Example of Slag Fuming
Stefan Köster 329

Technical level of Cladding
– Latest Developments –

Wolfgang Hoffmeister and Arne Manzke 341

The Importance of Pollution Control for the Acceptance of Waste Treatment Facilities

Uwe Lahl and Barbara Zeschmar-Lahl..... 363

The SNCR-Procedure
– A Proven Technology to Substancially Reduce NO_x Emissions in Waste Incinerators –

Zoltan Teuber..... 379

Catalytic Denitrification – Energetically Optimised

Christian Fuchs..... 389

Mechanical-Biological Treatment and Substitute Fuels

Mechanical-Biological Waste Treatment
– Process Concepts, Technology, Problems –

Stephanie Thiel and Karl J. Thomé-Kozmiensky..... 407

Experience in the Operation of Mechanical-Biological Waste Treatment Plants
– Report by the Operator of a German MBT Plant (Hannover) –

Beate Vielhaber and Roland Middendorf 431

Processing of Waste to Alternative Fuel

Michael Gursch..... 445

Potential of Development of Mechanical-Biological Waste Treatment Plants in Germany

Michael Nelles, Michael Balhar, Jennifer Grünes and Sabine Flamme 455

Energy Recovery from Substitute Fuels

Solid Recovered Fuel Power Station Eisenhüttenstadt for the Energy Supply of a Paper Machine

Kai Redemann and Leo Homann 469

Coal-Fired Power Plants for Co-Incineration of SRF – Plants, SRF Quantities and Qualities, Operational Experience, Trends and Forecasts –

Stephanie Thiel 483

Pre-Processing, Handling and Co-Processing of Alternative Fuels in the Cement Industry

Hubert Baier and Karl Menzel 503

Composting and Fermentation

Operational Experience in Composting Green Wastes Using the Example of Lodz

Bogdan Cieslikowski and Małgorzata B. Tomaszewska 515

Optimising Composting Systems Through the Upstream Installation of a Dry Fermentation Stage – Technology, Operation, Economics –

Nils Oldhafer, Thomas Raussen and Michael Kern 527

The Berlin Biogas-Project – The Production of Biomethane from Organic Waste –

Alexander Gosten, Thomas Rücker and Wilhelm Winkelmann 551

Synergistic Effects by Thermal and Biological Waste Treatment Facilities at Integrated Sites

Uwe Athmann, Werner P. Bauer, Thomas Kroner, Gerhard Meier and Peter Quicker 565

Recycling

Recovery of Recyclables from Municipal Solid Waste
Thomas Pretz and Michael Jansen 583

Comminution – an Essential Component of Waste Treatment
Donat Bösch 593

Processing of Heterogeneous Waste Streams by NIR Sorting
– Reflections on the Material-Specific Recovery based on selected M(B)T-Waste Streams –
Arne Michael Ragossnig, Manuel Sommer,
Simone Maria Pieber and Martina Meirhofer 613

Innovations in Sorting Processes for Mixed Household Waste
Regarding the Objectives of the National Waste Management Plan Poland 2014
Mariusz Rajca 629

Material Recycling of Mixed Commercial Waste in Austria
Gernot Kreindl 647

Recovery of Metals from Combustion Residues
Ralf Koralewska 657

Sewage Sludge

Concepts

Sewage Sludge Disposal in Switzerland
Hans-Peter Fahrni 673

Regional Disposal of Sewage Sludge Using the Example of the Canton of Zurich
– Thermal Sewage Treatment Plant Zurich-Werdhoelzli –
Michael Wehrli 683

Sewage Sludge Treatment in Large Cities Using the Example of Berlin
Ulrike Franzke 693

Sewage Sludge Treatment in Warsaw – Current Situation in Poland –
Aleksandra Cyganecka and Ireneusz Majszczyk 699

Future Concepts of Sewage Sludge Management
Thomas Vollmeier and Paolo Foa 715

Technology

Sewage Sludge Dewatering and Drying
Christian Schaum and Josef Lux 727

Sequenced Bioleaching and Bioaccumulation of Phosphorus from Sludge Combustion – A New Way of Resource Reclaiming –
Wolfgang Dott, Maxime Dossin and Petra Schacht 739

Phosphorus Recovery from Sewage Sludge
Mario Mocker, Ingrid Löh and Fabian Stenzel 751

Thermal Production of Fertilizer from Organic Waste
Rainer Heiniger 767

Mono-Incineration of Sewage Sludge – Options for Cost-Effective Sludge Utilization with Andritz Ecodry Technology –
Klaus Trattner and Manfred Winter 779

Co-Combustion of Sewage Sludge in Grate-Based Combustion Plants
Edmund Fleck and Steffen Scholz 799

Thermal Treatment of Sewage Sludge – Pyrobustor
Réka Tittesz and Uwe Neumann 809

Author index 827

Advertiser index 852

Subject index 861

The European Energy from Waste Market – Status and Perspectives

Jörg Zunft and Birgit Fröhlig

1. Legal framework 69

2. Status Quo 71

3. Waste arisings 71

4. Waste management and treatment 74

5. Energy recovery 75

6. Summary 76

7. Literature 76

1. Legal framework

Environmental protection has become an important priority in the European Union. Almost all of the environmental sectors are covered by the European Community Policy and related Community legislation. This also applies to the waste sector. Again, the EU is affecting here the Member States increasingly more and has provided in recent years for decisive steps that have been taken towards the further development of European waste management and the implementation of new technologies and concepts.

The legal framework for the European waste management constitutes the EU Waste Framework Directive (WFD). In addition, important regulations are anchored for the sector of waste treatment, such as the EU Waste Shipment Regulation, EU Directive on Packaging Waste, EU Landfill Directive, EU Waste Incineration Directive, and EU Combined Heat and Power Policy Directive.

In accordance with the Landfill Directive, the EU Member States have an obligation to prevent the production of methane gas from landfills, making therewith a contribution to climate protection. Therefore, the Directive requires a significant reduction in the deposition of organic waste. Based on the year 1995, the deposit of biodegradable municipal waste is to be reduced by the year 2006 by 25 per cent, by the year 2009 by 50 per cent, and by the year 2016 by 65 per cent. Moreover, a general pre-treatment regulation (ban on dumping of untreated municipal waste) is in force.

Since December 2005, the amendment of the EU Waste Framework Directive has been discussed and adopted in the year 2008 by a legislative resolution of the European Parliament. The revised version of the Waste Framework Directive has, inter alia, become necessary in order to clarify the definition of key terms, such as waste, recycling, and disposal, and to strengthen measures for waste recycling.

Due to the amendment, a new waste hierarchy in the following order

- Prevention and Reduction,
- Reuse,
- Recycling,
- Other recovery operations,
- Environmentally sound disposal

came into force. Waste prevention, reuse, and recycling obtained, due to the new 5-level hierarchy, particular importance. This hierarchy is to be understood as a flexible *guiding principle*, i.e. as a principle as such. Deviations are allowed if clear benefits can be proven for humans and the environment. The responsibility of the producers of the whole waste hierarchy has been committed. In addition, binding definitions have been created for the distinction between waste, by-products, and end-of-waste property.

Waste prevention programmes enjoy the top priority. Member States may adopt measures in order to transfer to the manufacturers of products an expanded responsibility for the prevention, recycling, or other disposal of waste. These include, for example, the withdrawal of products, the development of reusable or long-lived products, and the development of easily recyclable products. Member States should draw up by the end of the year 2013 waste prevention programmes, in which they should set their waste prevention objectives and measures.

Member States should take, according to the further order of the waste hierarchy, measures to promote high quality recycling from the waste arisings. By 2015, the separate collection of paper, metal, plastics, and glass should be introduced in all the Member States, and by the end of the year 2020 they should reach certain recycling rates (50 % for paper, metal, plastics, glass, and 70 % for construction and demolition waste). The separate collection of organic waste for the purpose of composting and anaerobic digestion also should be encouraged by the Member States. Recovery operations include e.g., in addition to the material recycling, also the processes of thermal recycling effective as a fuel. The differentiation between energy recovery and disposal of residual waste, disputed for a long time, has been finally clearly defined. In terms of the necessary resource efficiency, the replacement of raw materials or fuels by waste will in future be the key standard. The thermal waste treatment plants also can be recognised as energy recovery systems – but only if they provide good energy for use. As a standard, the R1 Criterion was, therefore, defined: New plants should demonstrate a value of 0.65, old plants should reach a value of 0.60.

The principles of self-sufficiency and proximity concerning the disposal of waste, which already have been valid so far for the disposal of residual waste, were extended to the recycling of mixed municipal waste. In the wake of the ban on dumping of untreated municipal waste, these principles still imply in many European countries the creation of additional treatment capacities. The amended EU Waste Framework Directive also amplifies the EU Waste Shipment Regulation in a sense that a member country may restrict the import of waste if national waste amounts could be thereby displaced by low-cost disposal/treatment options.

Altogether, the amended EU Waste Framework Directive and other relevant European frameworks for the development of the business model *energy from waste* ensure a favourable business environment.

2. Status Quo

The state of waste management in the European countries is moving differently at different levels. With its legal framework, the EU exerts the pressure to act on the competent authorities in the Member States. In some countries (Germany, the Netherlands, Belgium, Austria, Luxembourg, and Denmark), already before the European initiatives, waste management laws had been adopted; their goal was to prevent waste, utilise it, address environmental regulations by its treatment and, therefore, to terminate the deposition of untreated waste. Other countries (e.g. UK, France, Ireland, Portugal, Spain, Italy, and Greece) with particularly quite high landfill rates have just started this process or have currently been demanded that they fully implement the Union's waste policy at the national level.

A strong development need is particularly valid for waste management in the newer Member States of the EU, which still are dumping between 70 and 100 per cent of the waste. Transition periods for the implementation of the European ban on the dumping of untreated municipal waste have been defined. Efforts to implement the European waste policy can be recognised particularly in Poland, the Czech Republic, Latvia, Slovakia, Slovenia, Hungary, and Estonia. Collection and recycling systems have been, or will be, introduced. However, there is a lack of waste treatment facilities for residual waste that are compliant with the European standards. The landfills, still existing in large numbers, must be closed, or – if still needed – also upgraded to the European standards compliance level. The accession treaties with new Member States provide that the environment standards there will be the same in the foreseeable future as those in the old Member States. The EU funds under the Operational Programme *Environment*, inter alia, also the improvement and development of the waste management infrastructure in new EU Member States. Such projects initially focus on the upgrading of existing landfills, introduction of separate collection systems, development of (pre)treatment capacities (composting, sorting, recycling), as well as the strengthening of respective public administration structures.

The EU has already put in the current budget period at the disposal of the new Member States (e.g. Poland) funds in order to provide subsidies for thermal treatment facilities, too. Further funds are expected in the budget period starting from 2014. Moreover, transformation processes and respective investments in the waste treatment infrastructure are also supported by the European Investment Bank.

3. Waste arisings

Waste generation is influenced by various factors. Economic growth, demographic change, technological progress, and consumer behaviour are just a few, but important, factors. The past has shown that waste generation is linked in particular with the population and the development of national economies, as measured by the gross domestic product. In terms of these two indices, the following is predicted [1]:

The population in the New EU-12 countries is expected to decrease by 5 million and increase by 13 million in the EU-15 countries during the period 2005 to 2020. The total population in the EU-27 was 483.5 million in 2000, 492.8 million in 2010 and is expected to be increase to 498.8 in 2030.

Looking into country specific details the demographic assumptions are different: Whilst the population in Germany is going to decrease by 2 million between 2010 and 2015 with a further decrease by 8 million until 2050 the situation in the UK is completely the opposite. The assumptions show an expected increase of the population by 9 million during the period 2010 to 2050.

The differences in development between the old and new EU Member States are also reflected in the projected development of the country's gross domestic product. While for the old Member States, an annual increase of 2.0 per cent is predicted between the years 2005-2020, but the economic development of the new Member States will proceed more rapidly. For these countries, an annual increase of 4.1 per cent is predicted for the same period.

According to these indices, the actual forecasts are based on a growing volume of total municipal waste.

The generation of municipal waste was projected to be 290 million tonnes in the EU-27 in 2010 with a further growth to 336 million tonnes in 2020. Approximately 80 % of this waste will be generated in the EU-15. Waste generation per inhabitant has been increased during the last years, latest projections show a further increase until 2020. In 1995 the EU-27 countries generated 460 kg waste per person, this grew up to 520 kg per person in 2004. Assumptions show that this will increase to 680 kg per person [1].

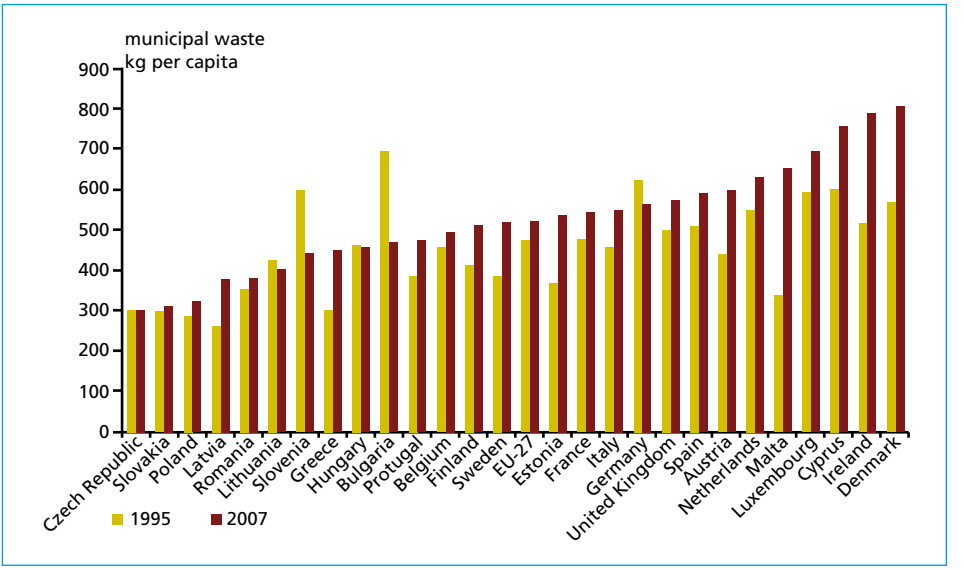


Figure 1: Generation of municipal waste in the EU-27, 1995 and 2007

Source: Diverting waste from landfill. Effectiveness of waste-management policies in the European Union. EEA (European Environment Agency) report, No 7/2009

There are considerable differences amongst Member States. The annual generation per person varies from 306 kg in Czech Republic to 453 kg in Greece and up to 802 kg in Denmark. Some countries have achieved a stabilisation of waste generation or even a reduction while others follow a constant increase. Summarising figure 1 the waste generation per person in the EU-12 was lower than in the EU-15 countries.

If it is assumed that the predictions are correct, the waste amount in the old EU Member States would increase in the years 2005-2020 by approx. 22 per cent (see Figure 2). The growth rates of individual countries are very different. For the Netherlands, for example, an increase of only 3.7 per cent is predicted, for Great Britain, however, an increase of 27.1 per cent is expected [2]. Approx. 80 per cent of municipal waste in these states (i.e. old EU Member States) is produced only by five countries: Germany, Great Britain, France, Italy, and Spain.

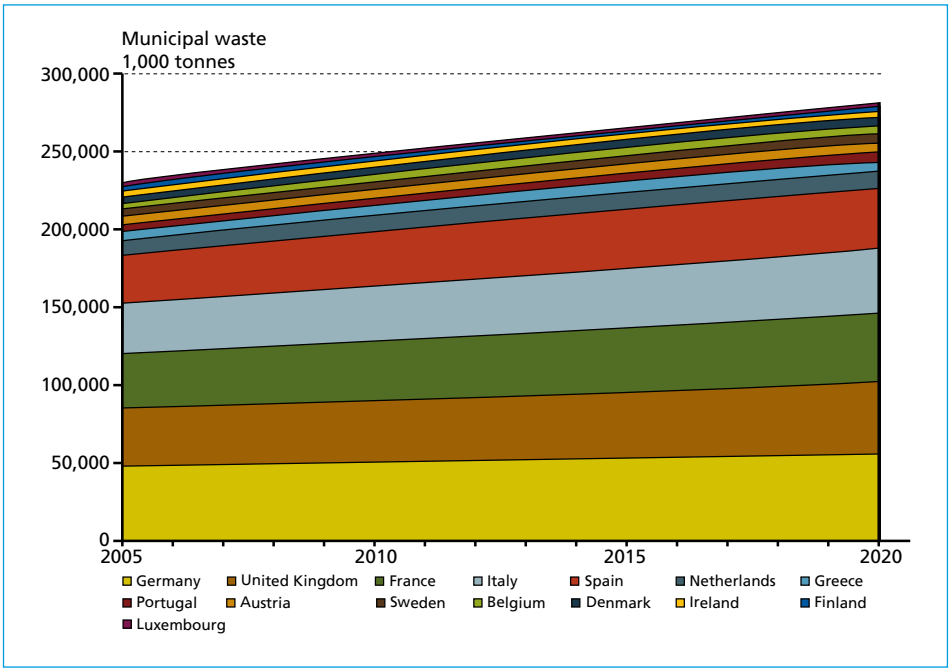


Figure 2: Municipal waste arisings in the EU-15 Member States, 2005 to 2020

Source: Environmental outlooks: Municipal waste. European Topic Center on Resource and Waste Management, 2006

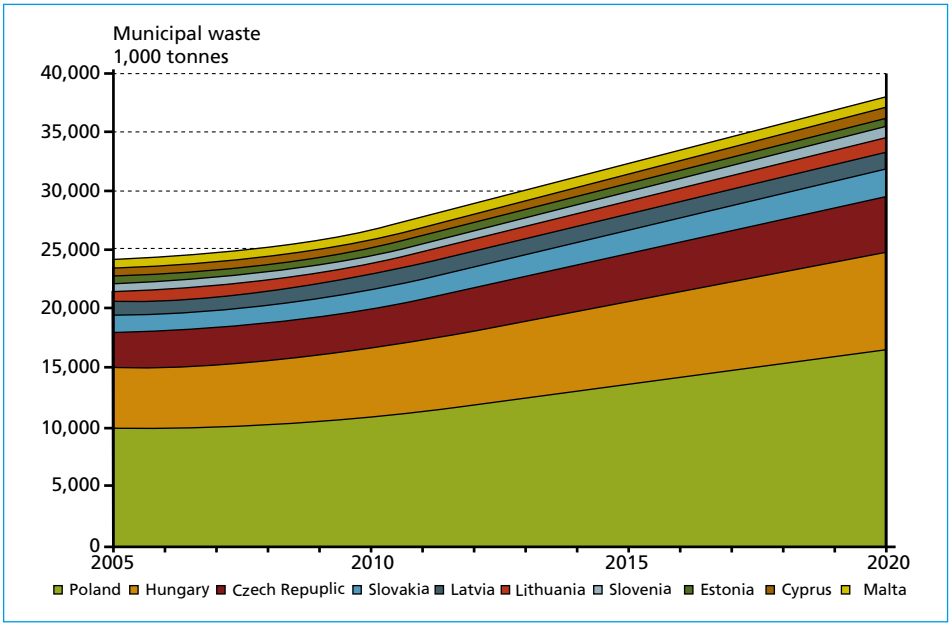


Figure 3: Municipal waste arisings in the EU-12 Member States (without Bulgaria and Romania), 2005 to 2020

Source: Environmental outlooks: Municipal waste. European Topic Center on Resource and Waste Management, 2006

Subject index

A

acceptance of waste treatment facilities 363, 373
advanced thermal treatment technologies 257
aerobic treatment 541
air cooled grate 237
alternative fuel 445, 503, 635
also see: solid recovered fuel
ammonia 573
anthropogenic metabolism 167
augsburg waste recycling facilities model 135
ausmelt process 330
austria 647

B

ban on landfilling 156
BAT document waste incineration 9, 17
BAT reference documents 4, 12
belt drier 451
belt filter press 731
Berlin 551
best available techniques 11
biodegradable waste 22, 55, 156
biodegradable waste treatment installations 124
biofuels 492
biogas 61, 533
biogas plant 554
biogas revenues 535
biogas utilisation 533, 559
biogenous waste 553
bioleaching and bioaccumulation of phosphorus from sludge combustion 739
biological drying 415
biological phosphate enrichment 741
biological treatment 414
biological waste management 437
biomethane 551
bio-natural gas 533
biowaste fermentation 531
biowaste treatment facilities 565
blocking of catalyst active surfaces 393
boiler 245, 315
boiler house 225
BREF 4
BREF/BAT activities 10
BREF/BAT-documents for waste incineration 9, 17
BSE 678
bubbling fluidized bed 785
build own operate 189
build own operate transfer 189
bunker 224
burnout 496

C

catalyst poisoning 391
catalysts 390
catalyst salinisation 392
catalytic denitrification 389
cement industry 503
cement kilns 161
centrifuge 730
chamber filter press 731
chlorine corrosion 495
CHP-certificates 59
circulating fluidized bed combustion 479, 496
cladding 341
climate 148
climate protection 561
CMT welding technology 349
CO_2 allowances 491
coal-fired power plants 483
co-incineration 118, 161, 799
co-incineration in cement plants 107, 161
co-incineration in coal-fired power plants 106, 483
co-incineratin of biofuels 493
co-incineration of sewage sludge in waste-to-energy plants 721
co-incineration of SRF 421, 483
co-incineration of waste 7
combined heat and power 58
combisensor 296
combustion residues 657
commercial waste 651
comminution 593
comminution effects 599

communal waste 83
compost 519
composting 140, 515, 520, 527
composting plant 517
composting vs. fermentation 562
concessions 47
contact dryer 734
contract types 46
contractual standards 49
convection dryer 733
corrosion 316, 420, 495
corrosion protection 241
crusher 598
cyclone furnace 788

D

decanter 730
denitrification 390
design build finance maintain 189
design build finance operate 189
design build maintain operate 189
dewaterability of sewage sludge 729
dewatering 728
digestion of sewage sludge 697
dimensioning of main components 223
dimethyl ether (DME) 259
dioxin emissions 372
disposal of organic waste on landfills 364
divestiture (outright sale) 47
double-layer weld cladding 347
drives 297
dry fermentation 527, 557, 567
drying 733
drying of dewatered sludge 722
dry sorption 399
dust removal 374

E

eco-efficiency 576
efficiency rating of different motor classes 299
EfW market organization in different countries 187
EfW plants – energy generation 75
electromagnetic sensors 653
emerging technique 12
emission levels associated with the best available techniques 12
emission limit values 14
emission of methane from landfills 364
energy efficiency 285
energy efficiency improvements along the energy chain 286
energy from biomass 59
energy from waste 257
also see: EfW
energy from waste market in Europe 69
energy from waste market – characteristics 183
energy-from-waste plants in the Netherlands 303
energy management 111
energy production from refuse-derived fuels 161
energy recovery 75
energy supply 151
environmental permit 66
EPC general contractor 190
erosion of boiler 495
European directive on industrial emission (IED) 3, 10
exhaust air from organic waste fermentation plants 573
external superheater 249

F

fermentation 414, 419, 530, 557, 567
fermentation product quality requirements 530
fermentation residue 530
fertilizer from organic waste 772
fertilizers 575
final storage landfill 165
financing 50
firing techniques 496
flame spraying 353
flue gas cleaning 225, 252, 270, 416, 480, 710
fluidised bed 769, 785
fluidised bed dryer 722
fluidised-bed furnaces 470, 695, 708, 720
fluidised bed incineration 692

fouling 495
full stream fermentation 414
furnace geometry 239

G

gasification 258
gasification technologies 262
gas processing 437
general arrangement plan 221
general contractor 183
granulator 598
granulometry 599
grate 101, 237, 306
grate ash treatment 280
grate-based combustion plants 799
grate movement 236
grate system 235, 308
greenhouse gas balance 149, 365
greenhouse gas emissions 566
grinder 598

H

hammering cleaning system 336
Hannover MBT plant 434
hazardous waste incineration 608
HCl-deposition 374
heat recovery
in waste to energy plants 315
heat recovery boilers 315
heavy materials 436
heavy metals 676
high duty combined heat and power (HD CHP) 62
high temperature gasification 264
high temperature plasma treatment 264
high temperature-SCR 394
horizontal hydraulic filter press 731
hospital waste incineration 139

I

IED 3, 10
immission control and acceptance 373
incineration 7, 258, 821
incineration of sludge 695, 708
incineration residues 275
Incineration technologies 233, 785
industrial waste 651
industrial waste sorting 652
integrated incineration of sewage sludge in a WtE-plant 718
integrated sites 565
integrated waste management concepts 133
integrated waste treatment 269
international treaty standards in waste management 43
investments in Poland 55
isasmelt process 331

L

landfill 364
landfill mining 120
landfills in modern waste management 163
layout planning of waste incineration plants 219
LCA 26
lease contracts 46
legislation in Poland 31
life cycle assessment (LCA) 26
light fraction 116
light packaging waste 585
limit values for MSWI in Germany 366
line scan cameras 653
load loss capitalization factor 290
low-dust-SCR 398
low temperature-SCR 395

M

mad cow disease 678
make or buy 187
management contracts 46
mass balances 423
mass burn 257
material identification with VIS/NIR 638
material recycling of mixed commercial waste 647
material stream separation 412
MBT 423
M(B)T-concepts 464

MBT Neumünster 461
MBT-technology 457
mechanical-biological stabilization 412
mechanical-biological treatment 98, 123, 407, 431, 455, 618
mechanical-biological treatment plants 373
mechanical-physical stabilization 412
mechanical processing 96
methane 573
methane formation 364
mono-incineration of sewage sludge 718, 779
motors 297
MSW composition 584
multi-stage furnace 718
municipal waste generation in the EU-12 73
municipal waste generation in the EU-15 73
municipal waste generation in the EU-27 72
municipal waste in Poland 77, 631
municipal waste incineration projects in Poland 158
municipal waste treatment in Europe 74
municipal wastewater sludge management 701

N

National Waste Management Plan Poland 2014 21, 156, 630
natura 2000 environmental permit 68
NCR-procedure 379
near-infrared-sorting 613, 653
Netherlands 303
NID-system 480
NIR sorting 613, 654
NIR spectra of different polymers 639
nitrous oxide 573
NMVOC 573
no-load loss capitalization factor 290
non-recourse financing 50
novel integrated desulfurization (NID) 479
NO_x emissions reduction 379

O

operating values for MSWI in Germany 366
operator's identity 6
OPEX 285
optical separator 637
optical sorting in municipal waste sorting processes 638
organic fertilizer 525
organic pollutants 678
organic waste 553

P

paper production with thermal utilization of residues 470
pathogenic germs 676
PCDD/PCDF 372
pellet press 449
percolation process 414
phosphate recovery 743, 771
phosphate recovery from sewage sludge 747, 751, 771
phosphate recovery methods 680, 756
phosphorus, annual flows in Switzerland 680
phosphorus, importance as nutrient 679
plasma gasification process 264
plastic distribution in MSW 583
plastic enrichment from MSW 587
plastic waste 116
Poland 81, 699
Poland, demand for MBT installations 123
Poland, investments 55
Poland, legislation 31
Poland, market for municipal waste 77
Poland, National Waste Management Plan 2014 21, 156, 630
Poland, recycling market 81
Poland, sorting plants 79
Poland, state of municipal waste management 124, 155
Poland, waste-to-energy projects and their perspectives 155
pollution control 363
PPP arrangements 53
private procurement 188
process water 757
project financing 191
public procurement 44, 188
pyrolysis 258
pyrolysis technologies 261
pyromix lance 802

R

radiation dryer 734
RDF
see: solid recovered fuel
recovery of metals 657
recovery of phosphorus 680, 743, 774
recovery of recyclables
from municipal solid waste 583
recyclable fractions 85
recycling 91, 609
recycling market in Poland 81
refuse derived fuel
see: solid recovered fuel
regeneration of catalytic material 393
regenerative thermal oxidation (RTO) 416
renewable energy 58
RES-certificates 59
residue utilization 269
resource management 119
ripe compost 519
risk assessment 48
risk management 185
risk sharing 187
rotary kiln 719
rotary shear 597
rotting 414

S

sale of compost 525
screw press 731
SCR reactors 390, 394
secondary air injection 239
sensor-based sorting 614
service contracts 46
sewage sludge 23, 115, 673, 752, 769, 779, 799, 821
sewage sludge ashes 759
sewage sludge composition 674
sewage sludge conditioning 730
sewage sludge, content of nutrients 674
sewage sludge, heavy metals 677
sewage sludge, recovery of phosphorus 745
sewage sludge dewatering 727, 730
sewage sludge digestion 697
sewage sludge disposal in Switzerland 673
sewage sludge drying 727, 733
sewage sludge incineration 695, 707, 718, 753, 779, 784
sewage sludge management 701, 715
sewage sludge processing facility 685
sewage sludge, pyrobustor 809
sewage sludge, regional disposal 683
sewage sludge treatment 693, 699
sewage sludge treatment before incineration 706
shredding 593
shredding mixing pumping (SMP) installation for hazardous waste 609
single-layer weld cladding 346
size reduction 593
slag fuming 329
slagging 495
slag treatment 140
sludge dispoal 716
sludge drying 790
sludge incineration technologies 786
sludge treatment options 724
sludge utilization 779
SNG 259
solid recovered fuel 98, 115, 421, 459, 462, 470, 485, 635
solid recovered fuel power stations 106, 117, 219, 421
solid recovered fuel power station Eisenhüttenstadt 469
solid recovered fuel processing 416
solid recovered fuels, characterization and quality requirements 493
sorting processes for mixed household waste 629
sorting technologies 652
SRF
see: solid recovered fuel
stability of combustion 496
steam turbine generator set 227
stoker type heat recovery boiler 317
storage volumes 223
sub-stream fermentation 414
superheater 249, 309
sustainable waste management 145, 151
synthetic natural gas (SNG) 259

T

tail-end-SCR 399
technology scepticism 376
thermal drying 415
thermal production of fertilizer from organic waste 767
thermal treatment technologies 133, 257
turbine house 227
turnkey plant construction 183

V

VOC 573
volume reduction (comminution) 595

W

waste batteries 22
waste bunker 224
waste comminution 594
waste containing asbestos 23
waste electrical and electronic equipment 23
waste gasification 258
waste heat boiler 330
waste heat recovery 315, 329, 333
waste incineration 7, 91, 258, 316, 821
waste incineration plants 219, 366
waste management facilities (WMF) 27
waste management plans 40, 173
waste management system 25
waste oil 22
waste paper 648
waste plastics 649
waste prevention 25
waste pyrolysis 258
waste-to-energy 119, 145, 222, 270
waste-to-energy cycle 150
waste-to-energy in Europe 212
waste-to-energy in Poland 157
Waste to Energy Research and Technology Council 206
waste treatment plants in Poland 156
waste water 680, 757
waste water treatment 418, 673, 705
waste water treatment in Warsaw 704
waste wood 115
water cooled damper 335
water cooled grate 237, 307
water steam cycle 473
weld cladding 342
wet fermentation 567
WTERT council 201, 209
WtERT Germany 209

X

x-ray separator 641
x-ray sorting 654