

Energy Data Management for Paper Industry

SIMATIC B.Data

Slovene Paper Days 2012, Bled Nov. 21st 2012

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- Introduction: customer questions, challenges and answers
- Overview Energy Data Management: what is EDM?
- Key functionalities of Energy Data Management
- Benefits of Energy Data Management
- Case study Lenzing AG

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Your challenge our answer



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Energy Data Management helps you to find answers for the key challenges of **SIEMENS** energy consumption in industry





Energy Monitoring: Continuous supervision of power consumption for plant or parts of production



Features & Benefit

Energy consumption overview

- Energy consumption for total plant and per production area incl. trend
- Total KPI for production efficiency (kWh/product)

Sorted load curve of power consumption

- Usage and duration of electrical power consumption per report period
- Identify potential of power usage over level and defined period



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Energy Controlling: Reports and dashboards for on demand transparency on **SIEMENS** consumption and costs



Benefits

KPI Performance and efficiency reports, e.g.

- User-friendly dashboard and reports with customized information
- Controlling of target achievement and benchmark information
- KPI performance per media, production site, plant area, key equipment
- Plant performance (productionbased energy cost)
- Batch & product related KPIs



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Energy Accounting: Automated accounting of energy costs to cost centers/departments



Features & Benfits

Cost transparency for all segments

- Accounting to cost centers/departments according to usage
- Create awareness for energy consumption and costs
- See tendencies (Rising, falling)
- Contribution of each department to energy policy (e.g. -5%)
- Compare usage with: previous period/period of last year
- Provide information to ERP Level

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Costs Overview

	Apr 2011				total p			
	Medium	Eper	105.170.4724	Unit	admin building	tank farm	ater treatment	
	Electrical Energy	absolut	86.196.984	€	8.605.973	3.589.253	2.196.102	l
	Technical Heat	absolut	16.965.687	€	933,113	239.733	4,794,651	
8 5	15,98%	percentage			5,5%	1,4%	28,3%*	
CC 1	Room Heat	absolut	2.446.423	€,	1.592.347	17.371 0.7%	463.228 18.9%	
	Natural Gas	absolut	26.400	€	2.640	2.200 8,3%	2.640 10,0%	
* =	Compressed Air	absolut	131.951	€	397 0.3%	26.456	39.685 30.1%	
< 100 sasure	Portable Water	absolut	35.667	€,	66 0.2%	1.585	4.822	
8 Ē	Waste Water 0,35%	absolut	367.360	¢	4.013 1,1%	4.000 1.1%	315.693 85.9%	
	Sum Rest I	absolut			507.424	89.545	358.181	
	Staff Factor I	percentage			17%	3%	12%	
	Sum Rest II	absolut			388.030	238.788	746.211	
	Staff Factor II	percentage			13%	8%	25%	
	Total Sum	absolut	106.170.472	¢	12.034.001 12.44%	4.208.931 48,31%	8.921.212	



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Energy Prediction: Optimize the energy procurement by predicting the energy consumption

Energy

Mental

Benergy

Data

Management

Energy

Benergy

Data

Benergy

Benefits

Be able to look to the future

- Using the appropriate prediction model
 - Based on production plan
 - Weekly profiles
- Basic information for buying and selling of energy

Optimize the energy procurement

Compare energy prediction to actual demand



12.05 02:00

Energy Efficiency Measures: Manage Energy Efficiency Measures and be comply with the ISO 50001 regulation

 Energy Monitoring

 Environmental Reporting
 Energy Data

 Nanagement
 Energy Controlling

 Management
 Energy Accounting

 Management
 Energy Accounting

 Margy Measures
 Energy Measures

Benefits

Management of Energy Efficiency Measures

- Comparison of measures before and after the implementation
- Display of
 - Saving potentials
 - Investment costs
 - CO2 impact
- Combine the capabilities and the current situation in an management report

Energy Efficiency Project Management 17.02.2012 10:20 [6] [€] [tco2] Compressed Air C-Project 52 Linz 10.000 EnergieDataManagement Syster A-Project 120 Munich 15.000 9,3 11.000 D-Project 4000 Praha 2.0 Ice Water 4000 **B**-Project 4100 Linz 1.000 0.2 Lighting Water leakage 400 Berlin 1.000 2.5 [€] [tCO2] [Years] 4100 Linz 1.000

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Environmental Reporting: Automatic provision of sustainability reports on each organizational level



Benefits

Transparency about all environmental topics

- Fast overview about sustainability issues on corporate, plant and process level
- Data consolidation over multi sites
- Automated calculation & reporting to reduce manual effort
- Flexibility to react on increased requirements



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+ + + Data | Dashboard / Sheet3

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Energy Data Management

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Corporate portal for energy data management



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Benefits of Energy Data Management - Summary

Energy Efficiency

- Improvement of total plant efficiency
- Overview of optimization potential

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- Reduced energy costs due to reduced consumption
- Improved procurement conditions due to better predictability (Energy tariff model optimization)

Savings

Transparency

- **Transparency** on energy and media consumption, costs, emission
- Allocation to consumer and cost center
- Predictability and target controlling
- Improved planning reliability and basis for decision making

Meet Legal Standards

- Support of ISO 50001 process
- Sustainability reporting
- Reports of quality audits

Awareness

- Increased energy consumption- and cost awareness
- Prove of sustainability and green production

Sustainable Invests

- Integration in existing system
- Integration of existing measuring equipment
- Seamless concept (Totally Integrated Automation)
- Scalable solutions

Case Study Lenzing AG Lenzing Group

The Lenzing Group with HQ in Austria is operating world wide. Grimsby Nanjing Great Britain China New York Paskov New York (USA) Shanghai Czech Republic China Patalganga Hong Kong (Under construction) China India Kelheim Mobile Coimbatore Alabama (USA) Germany India Lenzing Jakarta Austria Indonesia Purwakarta Heiligenkreuz Indonesia Facts and Figures 2011 Austria Sales: EUR 2.14 bn Production sites: Fiber production: 705,100 tons Fiber Plastics Engineering Staff: 6,593

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Source: <u>http://www.lenzing.com</u> Page 14 November 2012

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Case Study Lenzing AG Business Unit ENERGIE

Tasks of Business Unit ENERGIE



Group level

The ENERGIE business unit is responsible to develop concepts for energy providing facilities

Site level for the plant in Lenzing / Austria

- Service provider for
 - Energy and media to all Lenzing AG customers on a cost effectively way
 - Planner and operator of facilities including the grids
 - Collecting waste and sewage sludge for thermal recovery
 - Many task in the life-cycle of pulp production



Case Study Lenzing AG Energy Management = Services for several partners

Providing energy, requires transparency ... Price Accounting **Business Unit CC** Finance Energy amount **ENERGIE** (Corporate Center) Energy Energy costs Transformation Energy Well water Electricity / Gas -> Steam, ... **Energy procurement** Gas High temp. water Fiber, Pulp, ... Electricity Technique Compressed air (Business Units) Chillness Wood procurement Maintenance Natural water Fuels Nitrogen **Energy production** Shavings Electricity & distribution Bark Vacuum Wood 1)

1) 1 million t wood p.a.

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Case Study Lenzing AG Challenges

Biogenic fuels and residual substances 82,3% CO,-neutral Bark/ Sawdust Residual Substances/ 10,2% Sedimentation Sludge 28,6% Natural Gas Liquots 43,5% 7.9% Oil 0.9% Coal **Fossil fuels** 8.9% 17,7%

Source: http://www.lenzing.com/en/energy/facts.htmlPage 17November 2012Markus Bachl

Annual fuel consumption: 13.086.200 GJ

Kinds of energy

- Water (natural-, well-, drinking-, Fire extinguisher, EB-water, VE-water)
- Steam (3 bar, 4 bar, 15 bar, 40 bar, 75 bar)
- Electricity
- High temp. water (room heating, industry heating)
- Vacuum
- Compressed air (2 bar, 4 bar, 6 bar)
- Refrigeration
- Cover gas (Nitrogen)

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Case Study Lenzing AG Challenges

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Case Study Lenzing AG Challenges

Existing systems have to be interfaced **CC** Finance Interfacing the existing Plant Management Information Systems Energieplanung und Energiecontrolling Monitoring und (PIMS) Beschaffung Berichterstattung Energieeinkauf Emission → approx. 100.000 Variables Einkaufsunterstützung CO2 - Emissionsmonitoring Anbindung externer Systeme Szenarienrechner Abwasserentsorgung Facility Management → 10s cycle or on change • SAP Energie Instandhaltungsmanagement Prognose Energieabrechnung Management Energieprognose Kostenstellenzuordnung Budgetplan Auswertung/Abrechnung Energieberichtswesen approx. 1.400 feeders (400V) System Analyse und Reporting Energiefahrplan Energie- u. Stoffbilanzierung Workflowsystem → approx. 50% of data amount Energiebezugsfahrplan KPI-Berechnung Intranet/Internet Viewer Vorgaben an das LM Produktionszuordnung Acquisition of all mentioned energy and 2 Plant Information media data PIMS BEDAP Management System → detailed assignment to Business Units Prozess- / → CC Finance Automatisierungs-Mobile Daten-Zählererfassung Manuelle SPS Gebäudeleit-EmiDate ILC, SAT u. Feldebene Eingaben erfassung technik 59 Control Systems (internal development) and >40 standard control systems © Siemens AG 2012. All Rights Reserved. Page 19 November 2012 Markus Bachl Industry Sector

Case Study Lenzing AG Motivation for Energy Management

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Major target for system implementation



Increase the data quality



- Reduce the maintenance effort
- Reproducibility



- Structured approach
- Establish Energy Data Management

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Main task of energy data Management



Acquisition of all appropriate data (equipment and media)



Calculation of relevant KPIs



Specific efficiency KPIs (Boiler,..)



Balancing and Accounting

- 13 cost elements (media)
- 220 Cost Centers

Case Study Lenzing AG Solution – Apply the company structure to the system

3 steps to establish the company structure 🛖 🖡 📂 🖩 🏷 🔺 13 cost elements Start Einfügen Daten einfügen Stammdaten Administration Ansicht **Business Units** 🖶 🗁 Faser Water Electricity Steam 🖃 🚞 b.data 🗄 🦳 Plastics 🖶 🗁 LAGBDATA BU 1 🗄 🛅 Datenübernahme 🗄 🧰 Technik Centel 🗄 🦳 Energie 🗄 🛅 Zellstoff BU 2 🗄 🧀 Faser 🛅 Faser_Berichte Approx. 540 😟 🧰 Zentralbereiche 🗄 🧰 Faser_Brunnenwasser ost 🕂 🛅 Faser_Dampf 🗄 🗁 🛅 Zentralbereiche-US - 🛅 Faser_Druckluft accounting positions ŏ 🛅 Faser_EB-Wasser 🗄 🗁 Zentralbereiche-USA 220 🛅 Faser_Heißwasser BU n 🗄 🦳 EXT-Danisco 🚞 Faser_Kälte 🗄 🦳 Faser KAE Gesamt 🗄 🧰 EXT-Ensinger 🗄 🛅 Faser_KAE_Gesamt_zw C KAE_KST-105_LAUGESTATION VISKOSE SUED 🗄 🧰 EXT-Evonik C KAE_KST-107_ALKALISIERUNG V-SUED 🗄 🛅 EXT-Jodi C KAE KST-108 SULFIDIERUNG V-SUED Media (cost elements) 2 🖶 🧰 EXT-Lenzing-Sägewerk 🚞 Faser_Berichte C KAE_KST-112_LAUGENSTATION HB C KAE_KST-116_ALKALISIERUNG HB 🛅 Faser Brunnenwasse C KAE KST-123 VISKOSEKELLER HB 🗄 🛅 EXT-Papier KAE_KST-128_SULFOSORBON-ANLAGE - 🛅 Faser_Dampf 🗄 🛅 EXT-SML TAE_KST-129_SUPERSORBON-ANLAGE 🛅 KAE KST-134 KRISTALLISATION - 🛅 Faser_Druckluft 😟 🧰 Medien-Gesamt C KAE_KST-135_KALZINIERUNG 🛅 Faser_EB-Wasser Image: KAE_KST-147_SANDOFLAM - DISPERGIERANLAGE AE KST-151 PRODUKTIONSKONTROLLE FASERN (Analyt, Labor) 🛅 Faser Heißwasser Image: Image KAE_KST-164_QUALITÄTSKONTROLLE FASERN (Textil. Labor) C KAE_KST-165_VISKOSE-TECHNIKUM (Kleinspinnanlage) 🔁 Faser_Kälte 🖶 🛅 KAE_KST-108_SULFIDIERUNG V-SUED 3 C KAE_KST-193_ZUS. ENERGIE MODALFASER Image: KAE KST-428 LYOCELL PILOTANLAGE 🛅 Faser_Rohwasser 🗄 🛅 KAE_KST-116_ALKALISIERUN 🗄 🛅 Faser_Stickstoff 🗄 🛅 Faser_Strom 🗄 🛅 KAE_KST-123_VISKOSEKEL Cost center 🗄 🛅 Faser_VE-Wasser 🗄 🛅 KAE_KST-128_SULFOSORBO 🗄 🛅 Faser_Vakuum 🖶 🧰 Plastics 🗄 🧰 Technik

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Case Study Lenzing AG Solution – KPI calculation and Data Validation

Deviation in KPIs triggers a further detailed analysis



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Case Study Lenzing AG Solution – Example of energy reports

Transparency over all media including cost center allocation!

Aufbringung			m3
Energie-I		ana	267.566
Kondensataufbereitung Energie-II			66.222
Summe			333.788
Stromverbrauch	Direkt	Rohw.	Brunnenw.
	214.563	49.414	0
Stromverbrauch		kWh	kWh/m3
		263.977,40	0,79
Verbraucher	Kst.	m3	kWh
Verbraucher NMMO-Anlage	Kst.	m3 2.061	kWh 1.630
Verbraucher NMMO-Anlage Kesselhaus Anlage I	Kst.	m3 2.061 140.045	kWh 1.630 110.755
Verbraucher NMMO-Anlage Kesselhaus Anlage I Kesselhaus Anlage II	Kst.	m3 2.061 140.045 169.402	kWh 1.630 110.755 133.971
Verbraucher NMMO-Anlage Kesselhaus Anlage I Kesselhaus Anlage II	Kst. 361	m3 2.061 140.045 169.402	kWh 1.630 110.755 133.971
Verbraucher NMMO-Anlage Kesselhaus Anlage I Kesselhaus Anlage II	Kst. 361 362	m3 2.061 140.045 169.402	kWh 1.630 110.755 133.971
Verbraucher NMMO-Anlage Kesselhaus Anlage I Kesselhaus Anlage II Analytlabor	Kst. 361 362 151	m3 2.061 140.045 169.402 100	kWh 1.630 110.755 133.971 79
Verbraucher NMMO-Anlage Kesselhaus Anlage I Kesselhaus Anlage II Analytlabor Schwefelsäureanlage	Kst. 361 362 151	m3 2.061 140.045 169.402 100 22.181	kWh 1.630 110.755 133.971 79 17.542
Verbraucher NMMO-Anlage Kesselhaus Anlage I Kesselhaus Anlage II Analytlabor Schwefelsäureanlage Jodl - Auftr.Nr. 23003811	Kst. 361 362 151 290	m3 2.061 140.045 169.402 100 22.181 0	kWh 1.630 110.755 133.971 79 17.542 0

VE-Wasser

m3 Aufbringung 722.109 Rohw. Brunnenw. Stromverbrauch Direkt 93.290 57.130 110.733 kWh kWh/m3 Stromverbrauch 261.153 0,36 Verbraucher Kst. m3 kWh EB-Wasser kalt 1K8 295 3.388 1.225 370 18.787 MgO-Anlage 6.794 Zellstoff (Lastschrift VIFAS) 52 19 Viskosefaser (incl. Schwefelsäure) 578.746 209.305 Zellstoff 121.136 43.809 722.109 261.153 Summe m3 davon über Schwefelsäure 134.125

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EB-Wasser

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Case Study Lenzing AG Benefits based on systematic Energy Management

Transparency -> Key for successful Energy Management

Shorter acquisition cycles

- → Balance periods (so far "Month" new 15 Min.)
- → Immediately acting (Measures < 2-3 Days possible!)

Higher transparency

- → Detailed presentation of energy consumption and costs¹)
- → Better **process understanding** in terms of energy consumption
- → Reduction of complexity → customer can extend the system
- → Reproducibility, z. B. complex calculation algorithm also for other people
- → High data quality, higher availability, data validation

1) Using Web Clients finance department

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Case Study Lenzing AG Benefits based on systematic Energy Management

Reduced effort can be used for detailed energy consideration!

Reduced handling effort

- → Increased trust to data because of higher data quality
- → Reduced effort for data validation
- → On single system for data acquisition, data processing till analysis

Reduced system costs

- → Manual data collection is still possible and necessary
- → Web Client incl. data validation check

Production / Process improvement

→ Tracking of efficiency KPIs and energy efficiency measures in cases of deviations



Case Study Lenzing AG Summary

Consolidated findings



Further potentials available

- → visible through detailed data availability
- → Cost reduction by several percent points (12Mio. GJ fuel consumption)
- → Further potential feasible, also in cases if you optimize since decades.



Project execution as internal project

- ➔ Only you as customer have the deep process understanding
- → Complex historical grown systems can't be analyzed on a economical way
- → You increase your process knowledge in terms of energy management

Summary

→ Successful and systematic Energy Management can not be realized without Energy Data Management

Case Study Lenzing AG Future prospects

Rollout to further plants

Rollout to further plants

Certification according ISO 50001¹⁾

Technical extensions

→ Batch related data acquisition, and assignment of consumption and cost information

→ Using Benchmark information

- → Interface to the emission monitoring system
- ➔ Prediction of energy consumption



1) Lenzing is already certified according ISO 9001 and ISO 14001 2) EMIDATE (Siemens)

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Thank you for your attention!



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