Quality – Innovation – Future

A DMT Company Presentation

Earth. Insight. Values.

DMT

International Conference on “Trends and Prospects of Coal Production and Usage in Ukraine and Globally”

“Potential of Coal Mining in Ukraine”

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Kiev, 14th June, 2017

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2. DMT Experience Ukraine

“Potential of Coal Mining in Ukraine”

1. Current coal production / Domestic demand
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Introduction DMT

- Founded in 1990 in Germany
- Technical roots dating back to 1864 respectively 1737
- Today a division of TÜV NORD GROUP

- Global group of 14 consulting and engineering firms
- Headquarters in Essen, Germany
- > € 100 Mio. annual turnover
- > 750 employees
- DMT-Expert Bodies
  - 16 government approved expert bodies for safety
  - 3 accredited testing laboratories
  - 75 accredited experts

Mining Consulting & Engineering

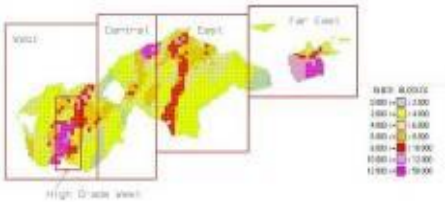
Comprehensive one-stop services for the natural resources industry

Our services:

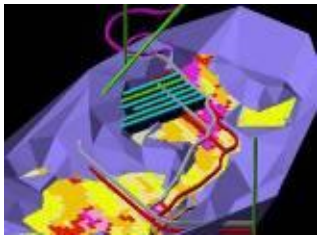
- International Mining Consulting
- Mining Engineering

One Shop Service for the Mining Industry

Greenfield development



Deposit-modelling



Mine planning

Process design

Assistance during operation

Mine site rehabilitation

DMT Experience Ukraine

DMT has long-term experience in Ukraine, e.g.

1. **Mineral Expert Report on Verticalnaya Coal Mine for Toronto Stock Exchange (2013)**
2. **Resource and Reserve Assessment for Donetsksteel (2013)**
3. **Validation of Twenty-year Strategy for DTEK's Coal Business Development (2012)**
4. **Health & Safety Audit for DTEK Coal Mines (2012)**
5. **Mineral Expert Report For Sadovaya Group (2010)**
6. **Mine Layout Optimisation For Lubelska 1-2 Mine (2011)**
7. **Due Diligence Review For Lubel 1 & 2 Coking Coal Project (2010)**
8. **Improving of Roadway Stability at Various DTEK Coal Mines (2007-2010)**
9. **Performance Improvement and Manpower Productivity Increase of 11 DTEK Coal Mines (2006)**

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1 Current coal production / Domestic Demand

Coal production in Ukraine 2015*	Coal import to Ukraine 2015*	Total demand
39.76 Mt	**14.6 Mt**	**54.36 Mt**

Unternehmen	2011	2012	2013	2014	2015	2011-15
staatliche	37,5	24,9 (-33,6%)	24,1 (-3,3%)	17,7 (-6,6%)	6,7 (-62,2%)	**-82,2%**
private	43,6	61,1 (+40,1%)	59,6 (-2,5%)	47,3 (-0,7%)	33 (-30,2%)	**-24,4%**
davon DTEK	38,4	39,6 (+3,1%)	40 (+1,6%)	35 (-2,5%)	26,7 (-23,7%)	**-30,5%**
Gesamtukraine	81,1	86 (+6,1%)	83,7 (-2,7%)	65 (-2,3%)	39,7 (-38,9%)	**-51,0%**

*Quelle: Ministerium für Energie und Kohlenindustrie, Kiew

- **Over 30% of coal consumption has been imported**
- **Particularly a large deficit of anthracitic and metallurgical coal**

*Source: Ministry of Finance of Ukraine

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2 Production costs

Average Coal Production Costs Ukraine

Privatised Mines: **55 - 65 US$/t** (estimated)

State Owned Mines: more than **150 US$/t** estimated

Average Price of Coal Import to Ukraine 2015

85.7 US$/t

- **Produce more Ukrainian coal or buy imported coal?**
- **For Ukraine it is worth to invest in domestic coal industry and reducing coal import!**

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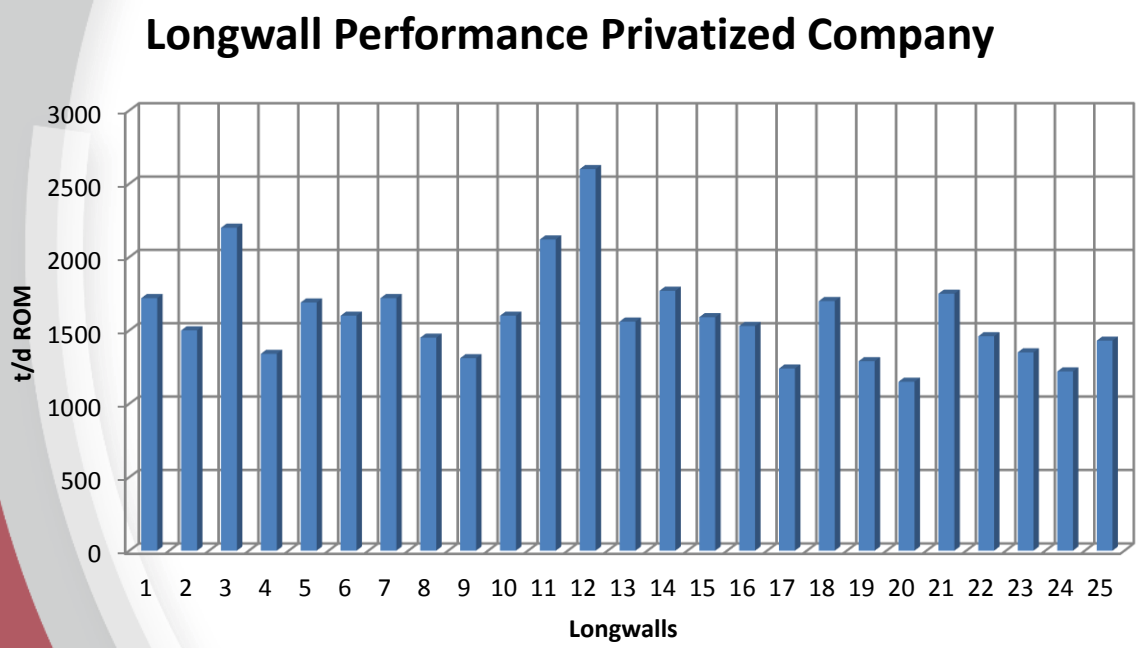
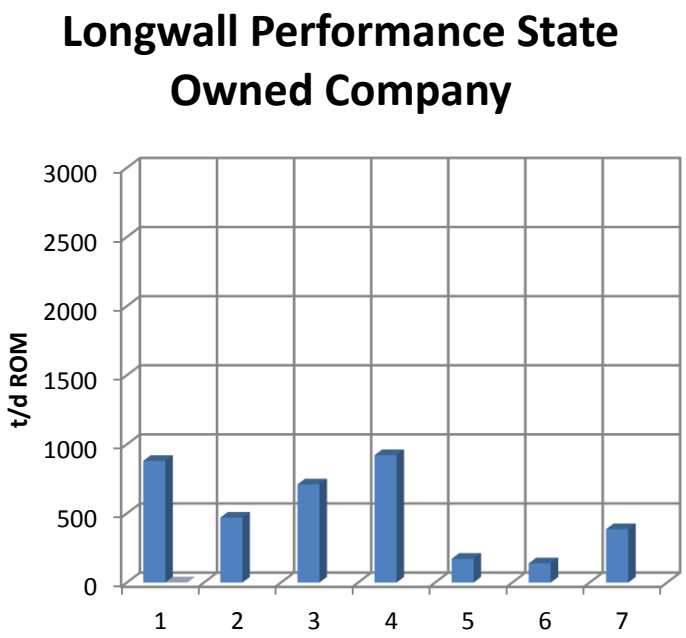
3 Longwall performance Ukraine





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4.1 Potential of production increase
“Longwall performance of German benchmark mines”

Mine	Seam Thickness [m]	Panel Width [m]	Gas Emission	Extraction Equipment	Average ROM Production [t/d]	Average Face Advance [m/d]
West (Germany)	1.40	203	low	GH 4.7 2x200 kW	5,370	9.4
Auguste Viktoria (Germany)	1.5	420	medium	GH42 2x800 kW	11,900	12.4
Auguste Viktoria (Germany)	1.17	312	medium	GH5.7 2x400 kW	8,400	8.6
Niederberg (Germany)	0.8	300	low	RHH	2,700	8.7
Ibbenbüren (Germany)	0.97	298	high	GH42 2x400 kW	9,930	11.0
Prosper (Germany)	1.55	350	medium	GH42 2x800 kW	8,960	6.3
Prosper (Germany)	1.51	350	medium	GH42 2x800 kW	12,380	8.9
West (Germany)	1.2	308	high	GH5.7 2x400 kW	8,750	11.4
West (Germany)	0.9	360	high	GH42N 2x630 kW	5,620	7.1

4.2 Potential of production increase
“Longwall performance of international benchmark mines”

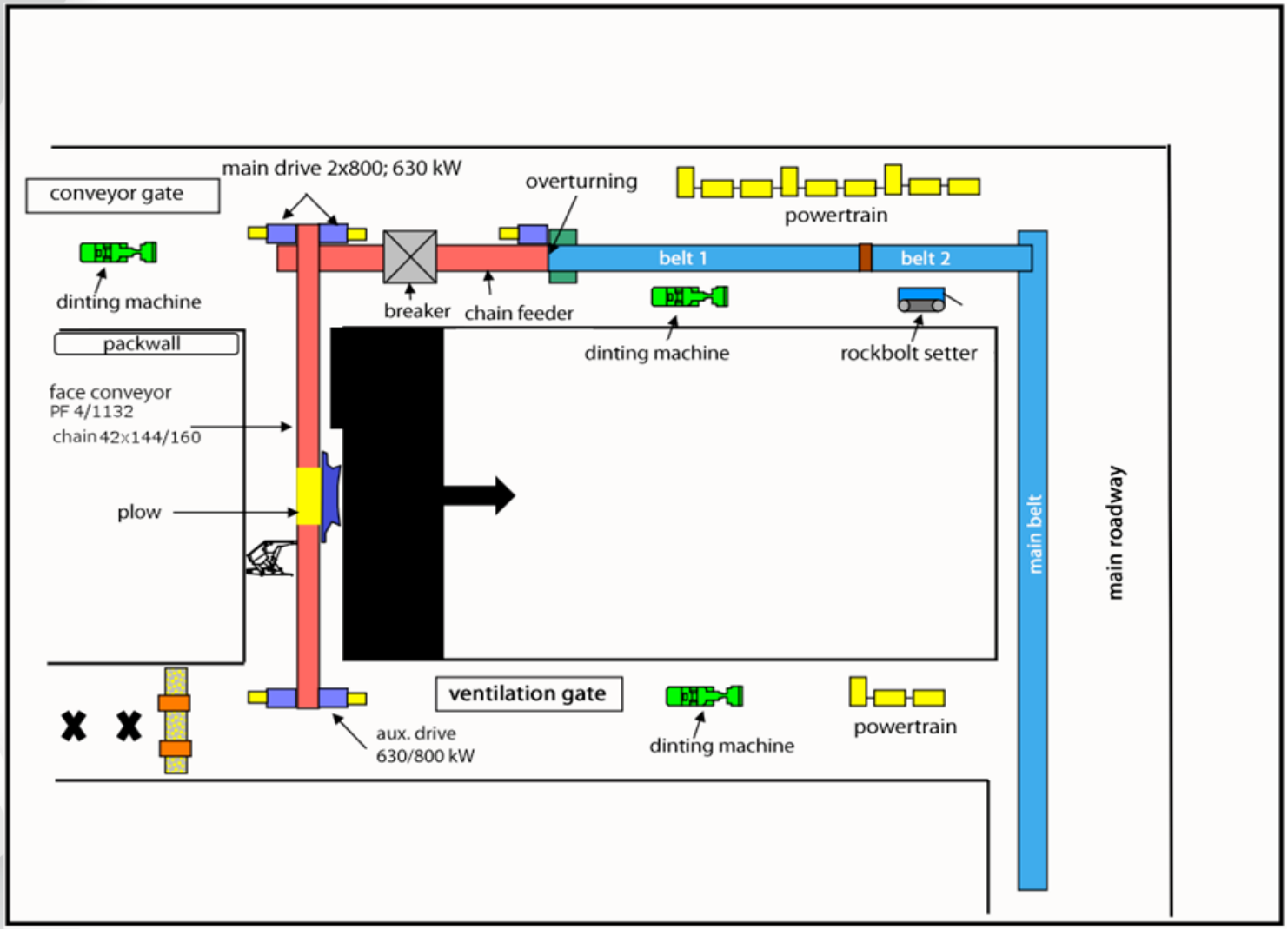
Mine	Seam Thickness [m]	Panel Width [m]	Gas Emission	Extraction Equipment	Average ROM Production [t/d]	Average Face Advance [m/d]
Mimosa (Mexico)	1.5	200	high	GH9-38 ve 5.7 2x400 kW	1,900	2.5
Bogdanka (Poland)	1.5	250	medium	GH1600 2x800 kW	8,200	10.4
Pervomayskaya (Russia)	1.1	300	high	GH800 2x400 kW	6,300	9.1
Pinnacle Mine (USA)	1.4	300	low	GH1600-3 2x600 kW	12,000	23.8
US Steel 50 (USA)	1.2	270	low	GH2.7 2x400 kW	8,200	18
Xiaoquing (China)	1,2	225	medium	GH9-38 2x400 kW	4,000	7.0
Paskov (Czech Republic)	0.9	246	high	PL9-38	1,800	6.6

4.3 Potential for production increase

- Experience of the benchmark mines working under similar geological conditions shows that face production rates of 200-300% can be achieved applying state of the art mining equipment and techniques.
- Various geological and mining conditions of Ukrainian mines allow choosing operations with the minimum natural production limitations (gas, hardness of coal, rock stability, etc.).
- After detailed technical investigations and cost estimation these mines can be targeted for investment focusing in state of the art equipment and mining techniques.

- Modern plow systems in combination with proper mining infrastructure (roadway cross sections and stability, haulage, ventilation etc.) can ensure mine production of some 5,000 - 7,000 t/d operating one longwall instead of proposed 2-3 longwalls working in parallel. At the same time cost reduction for infrastructure, roadway maintenance, gas drainage, transport and personal, etc. can be expected due to significant concentration of work and economy of scales effects.
- Investment in one high productive production equipment (e.g. plow) will provide for better availability and reliability, resulting in higher return on investment (ROI) than investment in 2-3 longwall sets with lower performance, reliability and production life.

4.4 Potential for production increase



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5 Performance constrains

The main constrains are:

- **Poor stability of roadways and insufficient cross sections**
- **High wear of mine infrastructure and production equipment**
- **High gas emission**

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6.1 Approach

1. Detailed technical analysis of mine potential (coal quality, reserves, CPP, personal, etc.) and factors limiting longwall face production (gas emission, strata stability, faulting, infrastructure capacity, etc.).
2. Ranging of the mines and identification of the most favorable assets for high productive equipment and state of the art mining techniques. Focus on deficit anthracite and met coal.
3. Development of detailed technical concept for the pilot testing mine/s. Equipment selection, production calculation, roadway dimensioning, infrastructure refurbishment in order to achieve maximum operating time of the extraction equipment.
4. Cost comparison with the base scenario (2-3 operations running in parallel). Financial analysis.
5. Selection and implementation of the pilot testing project.

6.2 Approach

CONCLUSIONS:

Implementation of the pilot project will provide the additional base for optimum development of the high potential mines as well as overall long-term development of Ukrainian coal assets.

Thank you very much for your attention!

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