ENERGY EFFICIENCY in INDUSTRY

CONSTRUCTION & UNDERGROUND MINING

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THE MOST ENERGY - INTENSIVE INDUSTRIES TO MANUFACTURE PRODUCTS WE USE EVERY DAY

- ALUMINUM
- CHEMICALS
- MINING
- IRON & STEEL
- PETROLEUM REFINING
- FOREST PRODUCT
- GLASS
- METAL CASTING
### SECTOR's FINAL ENERGY CONSUMPTION IN EU28 2013

<table>
<thead>
<tr>
<th>Sector</th>
<th>KTOE</th>
<th>SHARE</th>
<th>PROCES HEATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEMICAL AND PHARMACEUTICAL</td>
<td>51,485</td>
<td>18.9%</td>
<td>58%</td>
</tr>
<tr>
<td>IRON AND STEEL¹</td>
<td>50,815</td>
<td>18.6%</td>
<td>75%</td>
</tr>
<tr>
<td>PETROLEUM REFINERIES</td>
<td>44,657</td>
<td>16.4%</td>
<td>84%</td>
</tr>
<tr>
<td>NON-METALLIC MINERAL</td>
<td>34,249</td>
<td>12.6%</td>
<td>74%</td>
</tr>
<tr>
<td>PULP, PAPER AND PRINT</td>
<td>34,265</td>
<td>12.6%</td>
<td>59%</td>
</tr>
<tr>
<td>FOOD AND BEVERAGE</td>
<td>28,353</td>
<td>10.4%</td>
<td>62%</td>
</tr>
<tr>
<td>MACHINERY ¹</td>
<td>9,282</td>
<td>7.1%</td>
<td>40%</td>
</tr>
<tr>
<td>NON-FERROUS METAL</td>
<td>9,381</td>
<td>3.4%</td>
<td>32%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>272,487</td>
<td></td>
<td>66%</td>
</tr>
</tbody>
</table>

**Source:** ICF - STUDY ON ENERGY EFFICIENCY AND ENERGY SAVING POTENTIAL IN INDUSTRY AND ON POSSIBLE POLICY MECHANISMS

¹ Note that the EUROSTAT data presented for iron and steel sector group only covers the downstream steel making process; upstream iron making process is not reported under this figure.
1. EFFICIENCY – Energy, Materials, Fuel, Time,
2. ECOLOGICAL PRINCIPES – Overproduction, Technology
3. R&D – constant R&D
4. MEASUREMENT & DANA MANAGEMENT
5. LEGISLATION – Transnational regulations,
6. STANDARDIZATION – respect of international standards
7. EXCHANGE OF EXPERIENCE AND GOOD PRACTICES
8. COMMON SOLVING OF OBSTACLES
9. ETHNICITY – Population, Environmental, Flora & Fauna,
SECTORS THAT USE LARGE AMOUNTS OF MACHINES AND EQUIPMENT

CONSTRUCTION
- LAND DEVELOPMENT
- ROAD CONSTRUCTION
- CONSTRUCTION OF THE TUNNEL
- RESIDENTIAL DEVELOPMENT

MINING
- UNDERGROUND,
- SURFACE,
- MINING UNDERWATER

METAL PRECISION INDUSTRY
CHEMICAL AND PROCESS INDUSTRY
OTHER
## Consumption in Mining

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grinding</td>
<td>40.15%</td>
</tr>
<tr>
<td>Ventilation</td>
<td>20.05%</td>
</tr>
<tr>
<td>Material Handling Diesel</td>
<td>11.69%</td>
</tr>
<tr>
<td>Material Handling Electric</td>
<td>9.34%</td>
</tr>
<tr>
<td>Drilling</td>
<td>5.71%</td>
</tr>
<tr>
<td>Digging</td>
<td>5.44%</td>
</tr>
<tr>
<td>Crushing</td>
<td>3.01%</td>
</tr>
<tr>
<td>Separation</td>
<td>1.81%</td>
</tr>
<tr>
<td>Ancillary Operations</td>
<td>1.42%</td>
</tr>
<tr>
<td>Blasting</td>
<td>1.38%</td>
</tr>
<tr>
<td>Smelting, Refining, Casting</td>
<td></td>
</tr>
</tbody>
</table>
UNDERGROUND MINING - OVERVIEW

— ONE OF THE BIGGEST PRODUCTION SECTOR
— GLOBALY IMPORTANT SECTOR
— LARGE QUANTITY OF EQUIPMENT AND MACHINES
— HIGH CONSUMPTION OF ENERGY AND FUEL
— DIFFERENT TYPE OF ENERGY CONSUMPTION
— LARGE QUANTITY OF EMISSIONS
— SIGNIFICANT FUEL AND HEAT POLLUTION
— EXPENSIVE EQUIPMENT
— VERY BAD CONTROL LEVEL OF ENERGY CONSUMPTION
— USE LARGE & HEAVY PRODUCTION MACHINES
UNDERGROUND MINING – EE OPPORTUNITIES

- IMPORTANT INVESTMENT TO NEW PRODUCTION TECHNOLOGY
- INVESTMENT TO R&D
- NEW GENERATION OF DRIVING EQUIPMENT
- NEW MINING PROFILE
- REDUCE THE ENERGY CONSUMPTION – MACHINERY
- REDUCE THE ENERGY CONSUMPTION – EQUIPMENT
- REDUCE THE CO₂ & HEAT EMMISIONS
- REDUCE THE PRODUCTION COSTS
- NEW JOBS FOR HIGH EDUCATED AND SKILLED WORKFORCE
NEW UNDERGROUND MINING - TARGETS

- R&D INVESTMENT
- NEW MINING PROFILE
- REDUCE THE ENERGY CONSUMPTION – MACHINERY
- REDUCE THE ENERGY CONSUMPTION – EQUIPMENT
- REDUCE EMISSIONS THE CO$_2$, NANO-PARTICLES & HEAT LOSS
- REDUCE THE PRODUCTION COSTS
- CONTROL IN FUEL AND ENERGY CONSUMPTION
- ROBOTISATION AND PROCESS AUTOMATION
- NEW MONITORING & MACHINE CONTROL SYSTEM
NEW MINING EQUIPMENT - CHARACTERISTICS

- Battery or fuel cell powered machines
- Modular type of machines – new standards
- Remote control machines
- Ultra low profile machines
- Better control and management of machines
- Dramatically reduced energy consumption
- Distinctive features and safety equipment
- Low energy consumption
- Permanent control energy consumption
- Weight reduction of equipment
- Large reduction of emissions
NEW MINING TECHNOLOGY - PROVIDES

- NEW MINE CONSTRUCTION PROFILE
- MODULAR MACHINES & SIMPLICITY
- LOWER TOTAL INVESTMENT IN MINES DEVELOPMENT
- REDUCTION OF INVESTMENT TO THE NEW EQUIPMENT
- REDUCE THE SIZE OF PRODUCTION PANEL
- NEW PRODUCTION TECHNOLOGY & PROCESSES
- NEAR ZERO POLLUTIONS
- NEAR ZERO EMISSIONS
- LOWER INVESTMENTS TO AIR CONDITIONING
- HIGH LEVEL OF PROFITABILITY
- SIGNIFICANT REDUCTION IN WASTE ROCK EXCAVATION
- BETTER SERVICE AND SIMPLIFIED MAINTENANCE
INVESTMENT IN DEVELOPMENT REDUCE THE COSTS OF MATERIALS, ENERGY, SERVICES AND LABOUR
BARRIERS

- MARKET BARRIERS
- COMPETITIVE MARKETS
- INFORMATIONS & COMMUNICATIONS
- FINANCE
- TECHNOLOGICAL & INFRASTRUCTURE BARRIERS
- CONSUMER HABITS & BEHAVIOUR
- GOVERNMENTAL REGULATIONS
- MARKETING BARRIERS
- SUPPLY MONOPOLISTS
- STORAGE & SKILLED PEOPLE
- POVERTY
NEW POLICY APPROACHES FOR ENERGY EFFICIENCY IN INDUSTRY

• MANDATORY INDUSTRIAL ENERGY AUDITS
• ENERGY EFFICIENCY MANAGEMENT IN THE INDUSTRIAL ENTERPRISES AND ANNUAL REPORTING OF ITS IMPLEMENTATION
• DEVELOPMENT OF PUBLIC-PRIVATE PARTNERSHIP FOR IMPLEMENTATION OF ENERGY EFFICIENCY MEASURES
• INDUSTRIAL ENERGY EFFICIENCY NETWORK
• PROMOTION OF ENERGY MANAGEMENT SYSTEMS
• INTELLIGENT METERING IN THE INDUSTRIAL ENTERPRISES
• CREATION OF BUSINESS PARKS
NEW INDUSTRIAL EQUIPMENT PROVIDES SIGNIFICANT REDUCE OF ENERGY & FUEL CONSUMPTION ON THE NATIONAL AND GLOBAL LEVEL

DRASTIALLY REDUCE THE INVESTMENT IN MINING DEVELOPMENT AND PROVIDE GREATER PROFITABILITY OF THE MINING SECTOR

INVESTMENTS IN DEVELOPMENT OF NEW MACHINERY AND EQUIPMENT HAS SIGNIFICANT IMPACT ON DEVELOPMENT OF THE NATIONAL ECONOMY

CONSIDERABLY ENCOURAGES JOB CREATION FOR HIGHLY EDUCATED AND QUALIFIED PERSON
— LARGE R&D INVESTMENT
— THE NEW GENERATION OF MACHINES DESIGNED
— MODULAR & INNOVATIVE EQUIPMENT
— EXCELLENT PERFORMANCE
— EXTREMELY LOW ENERGY CONSUMPTION
— NO EMISSIONS AND POLLUTIONS
— ULTRA LOW PROFILE & REMOTE CONTROL MACHINES
  - DRILL RIG, DOZER, SWEEPER, BOLTER, LOADER
  - WIRELESS DOZER
  - UNDERWATER SPECIAL PURPOSE REMOTE CONTROL MACHINES
— PROTOTYPES TESTED
— THE MACHINES DO NOT USE DIESEL FUEL
— FEW MACHINES NOW OPERATE ABROAD
NATIONAL OR INTERNATIONAL DEVELOPMENT CENTER

- R&D GROUP (3D DESIGN - mechanical, electrical, electronic, ....)
- PROCUREMENT DEPARTMENT (market research, supply, ordering)
- EQUIPMENT & NEW PARTS PRODUCTION
- EXAMINATION (parts & equipment)
- ASSEMBLY (equipment, tools & machines)
- TRIAL
- TESTING PLATFORM
- STANDARDIZATION & LABELING
- AUDIT & CERTIFICATION
- NEW TECHNOLOGY DEVELOPMENT CENTER
<table>
<thead>
<tr>
<th>DEVELOPMENT</th>
<th>PRODUCTION</th>
<th>EXEMINATION &amp; TESTING</th>
<th>FUNCTIONAL POSSIBILITIES OF MACHINES</th>
</tr>
</thead>
<tbody>
<tr>
<td>MECHANICAL PARTS AND EQUIPMENT</td>
<td>PRODUCTION</td>
<td>ASSEMBLY</td>
<td>EQUIPMENT AND MACHINES</td>
</tr>
<tr>
<td>POWER EQUIPMENT AND MANAGEMENT</td>
<td>PRODUCTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT COMPONENTS &amp; SYSTEMS</td>
<td>PRODUCTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEW MACHINES PROTOTYPES</td>
<td>PRODUCTION</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**R & D CENTER**
BATTERY POWERED MACHINES
FUELCELL & BATTERY POWERED
THANKS

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