

# Resource-efficient practices in the Ukrainian concrete products industry

POCKET GUIDE

Business case  
for saving money  
and increasing performance



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EaPGREEN  
Partnership for Environment and Growth



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## Why this pocket guide?

The performance of Ukrainian concrete and reinforced concrete products enterprises has improved during the recent decade. However, productivity is seriously hampered by the insufficient management of the use of materials, water and energy.

The current economic context of the concrete production industry and of Ukraine as a whole will force concrete-producing enterprises to undergo important transformation. Resource and energy efficiency are likely to be key determinants of success in this transformation.

This pocket guide will provide you with insights on best practices for ensuring energy, materials and water efficiency. It gives an overview of the most common challenges for businesses in the concrete production industry and effective ways of dealing with them. You will learn about practical ways to increase or sustain the quality of materials, reduce water and heat use and rationalise energy use, as well as about possible costs and payback periods associated with these measures.





# The case for energy efficiency

Potential problems that lead to excessive costs for your business:

- Prices for fuel and electricity rising
- Obsolete equipment
- Damaged pipelines causing leakage of compressed air
- Steam pipes and production facilities lacking thermal insulation
- Suboptimal heat distribution

What can you do to solve these problems?

- Use automated production systems
  - Control energy and heat distribution and consumption
- Insulate buildings and equipment
- Set optimal mode of equipment operation
- Use alternative fuels
- Partially or completely switch from old technical equipment lines to modern energy-saving ones
- Install energy-efficient lighting
- Adequately maintain compressed air systems

What are the benefits of better energy efficiency for your business?

- Reduced fees for energy (electricity, natural gas, petrol)
- Reduced energy dependency
- Reduced CO<sub>2</sub>

## Did you know...?

**...that energy costs are a major share of production costs?**





## Practical solutions and recommendations

**Challenge:** A significant number of reinforced concrete enterprises that were built 20-30 years ago still use outdated and energy-intensive production equipment. It usually includes powerful induction motors with considerable consumption of reactive power. Additionally, concrete production uses large quantities of compressed air for transporting bulk materials and controlling machinery.

Air compressors are a very electricity-intensive technology.

A photograph of industrial machinery, likely an air compressor, with a yellow-bordered text box overlaid on the right side. The machinery is made of metal and has various pipes and valves. The text box contains the words 'Remember!' in red, followed by a dotted line, and then the text 'Minimising the heat and energy losses is important for your business' in black.





### Remember!

Minimising the heat and energy losses is important for your business



**Solution:** Excessive energy consumption can be reduced in several ways, ranging from installing frequency converters for electric motors and reactive power compensators to replacing energy-intensive equipment with energy-saving one. For example, energy efficiency of artificial lighting in work premises and office buildings could be achieved by simply replacing existing light bulbs with more energy-efficient ones. Reduction of losses in compressed air systems and finding an optimal compressor function mode can significantly reduce operational costs. Reusing warm air generated by the compressor's cooling system for room/premises heating could also be considered.

### Business case:

					
Replacement of light bulbs by LED in office buildings	92 EUR	55 EUR/ year	1 year 9 months	930 kWh	Simple solutions
Maintenance of compressed air system's pipes and replacement of armature	550 EUR	1 100 EUR/ year	6 months	up to 300 000 m <sup>3</sup> of compressed air	
Installation of electrical reactive power compensators	6 800 EUR	9 100 EUR/ year	9 months	2 613 300 kWh	Investment - intensive solutions
Switching to the pump with reduced power and capacity	5 000 EUR	1 200 EUR/ year	4 years and 1 month	21 400 kWh of electricity	



Investment



Cost savings



Payback period







Resource savings





## Business case:

					
Thermal insulation of the manufacturing constructions	210 EUR	1 300 EUR/ year	2 months	26 378 kWh	Simple solutions
Curing pit insulation	460 EUR	1 830 EUR/ year	4 months	34 330 kWh	
Maintenance of the condensate discharge system	240 EUR	210 EUR/ year	1 year and 2.5 months	851 m <sup>3</sup> of natural gas	
Maintenance and modernisation of steam lines	6 700 EUR	8 400 EUR/ year	10 months	33 600 m <sup>3</sup> of natural gas	Investment - intensive solutions
Use of additives for concrete to decrease time of heating	18 000 EUR/year	48 100 EUR/ year	Less than 5 months	192 500 m <sup>3</sup> of natural gas	



Investment



Cost savings



Payback period



Resource savings

**Challenge:** Curing is a necessary step in the production of reinforced concrete. In most cases, this process occurs at a specific steam temperature. In order to produce this steam, gas-fired boilers are used. Such problems as loss of heat to the environment through uninsulated pipes or fixtures can lead to a drop of steam pressure and low efficiency of products heating and inefficient natural gas consumption.

**Solution:** There are a number of effective solutions that address such cases: thermal insulation of pipelines and equipment, timely repair and maintenance of thermal systems. The use of chemical additives in ready-mixed concrete allows avoiding or decreasing the heat treatment (curing). Return of condensate should be properly tooled.

# The case for efficient use of materials



Potential problems your business can face when using and storing materials:

- Local availability of resources
- Losses of materials during the transportation, loading and storage
- Pollution due to production
- Waste generation
- Declining quality of raw materials

## Did you know...?

**...that efficient use of raw materials with minimal waste generation leads to increased productivity?**

What can you do to solve these problems?

- Adjust raw materials input and quality control at all stages of the process
- Replace traditional raw materials with less toxic alternatives, where possible
- Reuse waste or produce useful by-products
- Use waste from other industries as raw materials
- Reduce transportation distances and the use of polluting vehicles



## What are the benefits of more efficient material use and storage for your business?

- Improved raw material and product quality
- Longer conservation of raw materials
- Reduced waste generation
- Decreased costs per unit of production
- Lower pollution taxes for air emissions and waste disposal

## Practical solutions and recommendations

**Challenge:** Such issues as inefficient use and losses of materials during their transportation to the place of processing, preparation of the concrete mix and delivery of the final product are not yet addressed in this industrial sector in Ukraine. This leads to high consumption of raw materials per unit of output and related significant costs, low product quality and, therefore, low competitiveness of enterprises.

**Did you know...?**

...that raw materials selection affects the quality and value of final output?













**Solution:** Weighing incoming materials enables the determination of the actual resource consumption and actual losses during transportation. Quality control helps avoid excessive use of material in the concrete mix and achieve the required strength of the finished product.

Automation of concrete mixing and transportation units is one of the options used to obtain better control of the amount of raw materials used, achieve high quality of concrete, and deliver ready-mixed concrete to production shops without residuals.

## Business case:

					
Full automation of the concrete mixing unit	46 300 EUR	60 300 EUR/ year	9 months	4 850 tonnes of materials per year	} Investment - intensive solutions
Installation of automated delivery line of concrete to the production sites	130 000 EUR	44 500 EUR/ year	Less than 3 years	6 120 tonnes of materials per year	

 Investment
  Cost savings
  Payback period
  Resource savings







**Challenge:** Concrete manufacturing process generates waste mainly due to:

- Spillages and leaks from concrete forms
- Concrete residue in transportation vessels
- Concrete surplus hardening before its intended use
- Substandard quality products
- Generation of waste from reinforcements' scraps

**Solution:** A solution to this problem is either to avoid generating waste or reuse it in the manufacturing process.

## Business case:

					
Return concrete mix residues into the production process	No investment needed	1 110 EUR/ year	None	95.9 tonnes of materials per year	Simple solutions
Optimise cutting of reinforcing rods (to reduce the creation of unused scraps)	No investment needed	600 EUR/ year	None	1.6 tonnes of material per year	
Reuse crushed waste concrete as an inert filler (secondary aggregates)	1 250 EUR	1 970 EUR/ year	7 - 8 months	350 tonnes of materials per year	Investment - intensive solutions
Remove gaps in moulding forms to prevent leakages of cement grout	1 200 EUR	1 400 EUR/ year	10 months	127.5 tonnes of materials per year	
Set the butt welding machine for steel rods	6 250 EUR	6 330 EUR/ year	1 year	14 tonnes of materials per year	



Investment



Cost savings



Payback period



Resource savings

# The case for saving water



Potential problems associated with inefficient water management:

- Overconsumption of process and sanitary water
- High costs due to increasing fees for water consumption and discharge
- Significant water losses due to leaking or bursting old pipes
- Increased pollution of groundwater and surface water and resulting deterioration of process water quality

What can you do to solve these problems?

- Install meters at production sites and in administrative buildings
- Inspect and repair pipelines and plumbing equipment
- Brief your personnel on simple water saving techniques
- Install automatic controls for water shut-off
- Introduce automatic washing equipment
- Install water recycling systems
- Install rainwater collecting systems







## What are the benefits of water conservation for your business?

Rational water consumption, maintenance of water supply systems in good condition and water management allows your enterprise to:

- Reduce water losses
- Reduce wastewater discharges
- Reduce the amount of fees for water use and wastewater discharges
- Save energy used for pumping and delivery of water

### Remember!

**Water is used at all stages of production and is needed for the functioning of the whole business; water is an indispensable resource.**







## Practical solutions and recommendations

**Challenge:** Water at concrete products enterprises is used for process and sanitary purposes. As part of the technological process, water is used as a component of the concrete mix, as an agent for the heating and curing of products, as well as for cleaning equipment, vehicles and premises. If these uses are poorly managed, water consumption is often excessive. In addition, it is difficult to detect breaks in the obsolete underground piping systems, which results in significant water leakages.

**Solution:** The amount of water used for sanitary needs can be reduced through low-cost solutions and its sparing consumption by the personnel. The cleansing process using automated high pressure washing machines significantly reduces water consumption. Water use in the production process can also be reduced due to the use of chemical additives, while the optimisation of steam systems cuts the use of water for heat transfer.

### Business case:

					
Reduction of steam consumption as the curing optimisation side effect	No investment needed	670 EUR/ year	None	2 600 m <sup>3</sup> of water per year	} Simple solutions
Installation of water saving sanitary equipment	120 EUR	200 EUR/ year	7 - 8 months	605 m <sup>3</sup> of water per year	
Repairing piping and replacement of sanitary fittings to eliminate water losses due to loose connections and leaks	230 EUR	400 EUR/ year	5 - 6 months	1 200 m <sup>3</sup> of water per year	



Investment



Cost savings



Payback period



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## Useful Information

### Ukrainian Association of Construction Materials Producers

The Association is a member of the European Association of Producers and Distributors of Construction Materials (UFEMAT). It presents and defends the interests of its members in governmental institutions and mass media; provides consultancy services, conducts various informational events, enables experience and information sharing that improves performance of the association's members; serves as a co-ordinator between Ukrainian enterprises, foreign investors and the government on issues related to the construction industry development.

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## Resource Efficient and Cleaner Production Centre

The primary goal of the Resource Efficient and Cleaner Production (RECP) Centre in Ukraine, created under a UNIDO project, is to enhance resource productivity, competitiveness and environmental performance of the national industry. It supports the adaptation and adoption of RECP methods, practices, technologies and policies, provides national industries with necessary tools to facilitate access to national and regional markets with environmentally sound products and improve the ability of national enterprises to successfully negotiate their position in the global market. The RECP Centre conducts technical audits in enterprises, provides trainings and prepares national experts, disseminates information on RECP benefits, conducts independent technical reviews of equipment and project documentation, and develops related policy measures.

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Website: <http://www.recpc.kpi.ua>



## List of enterprises

Case studies presented in this pocket guide were prepared on the basis of RECP assessments conducted by trainee experts under the UNIDO Demonstration component of the EaP GREEN Project using UNIDO-UNEP RECP tools and methodology ([www.unido.org/cp](http://www.unido.org/cp)). The business cases are based on RECP assessments of the following enterprises:

- “Brovary Construction Plant”
- “S. Kovalska Reinforced-Concrete Plant”
- “Kombinat budindustrii”
- “Spetsbeton” plant
- “Reinforced concrete plant No.1”
- “House building factory No.3”
- “Gnivan Plant of Special Reinforced Concrete”

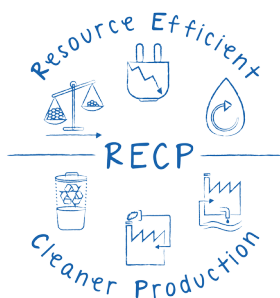






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