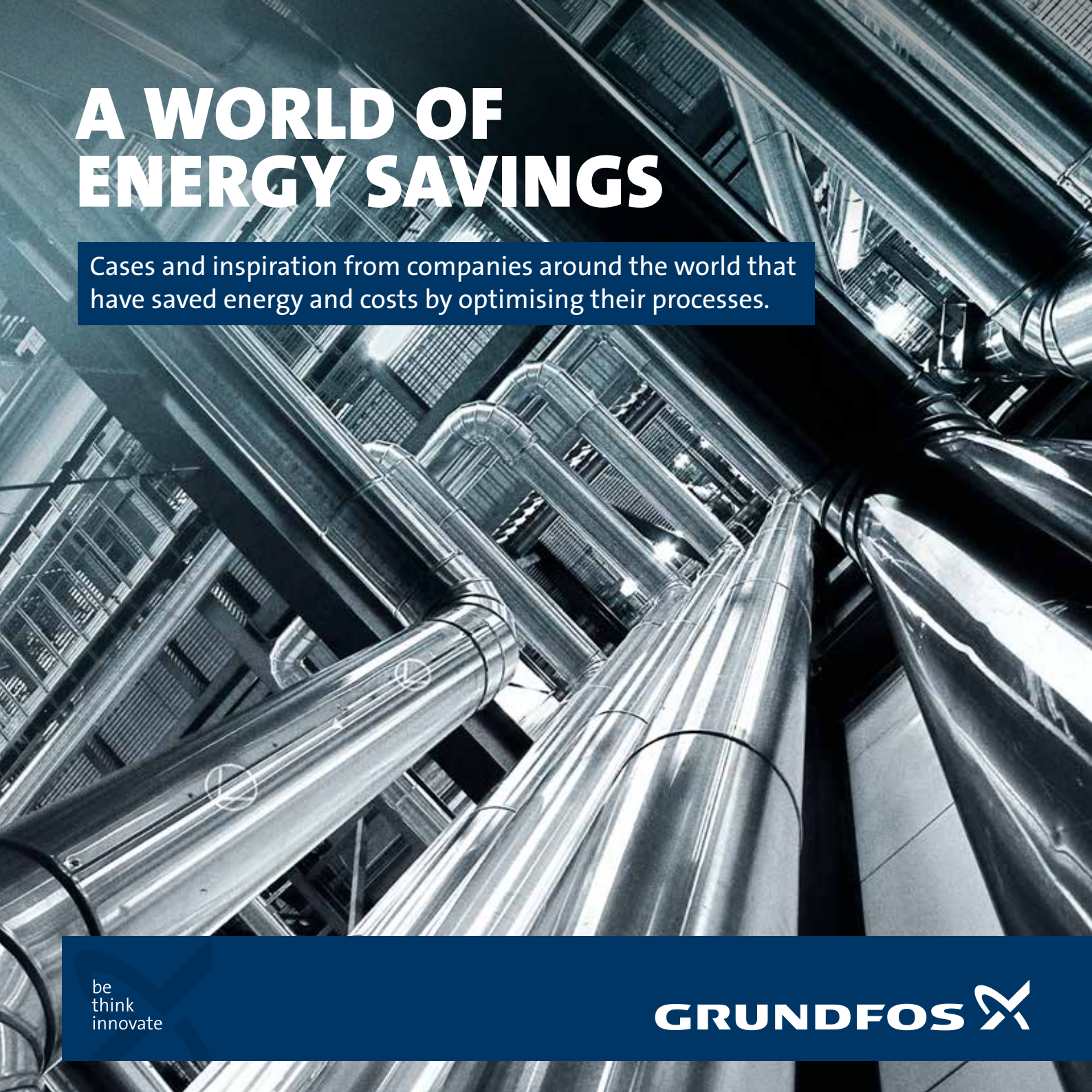

A WORLD OF ENERGY SAVINGS

Cases and inspiration from companies around the world that have saved energy and costs by optimising their processes.

be
think
innovate

GRUNDFOS

Welcome to a world of energy savings

You will find inspiration and information from a wide range of process industries, water utilities and commercial buildings, which have saved energy and costs by optimising their processes.

Energy Check

A Grundfos Energy Check provides you with an overview of the life cycle costs of your pumps. It gives you an indication of possible energy savings, and helps you make decisions on future pump replacements.

- **System evaluation** – Evaluation of the life cycle costs of your pumps and installation
- **Overview** – Detailed information about your energy-saving potential.
- **Sustainability** – Actionable sustainability areas to improve the environmental profile of your facility.
- **Installation suggestions** – Prioritised installation list that details the pumps and systems which could benefit from an upgrade.

Grundfos has performed either an Energy Check or an Energy Audit on the customers' pump installations and made proposals for replacement of pumps and solutions. All with the purpose of achieving energy savings and improving the environmental footprint.

Enjoy!

Energy Audit

The Grundfos Energy Audit is a six-step diagnostic tool developed by Grundfos to identify excessive energy consumption in any kind of pumping system.

- **Initial contact** – Prequalification of the site through a discussion of relevant site information or an Energy Check.
- **Diagnosis** – Inspection of the premises and draw up of a list of performance data and installed pumps, pinpointing focus areas.
- **Proposal** – The Energy Audit is carried out by logging data, resulting in a load profile for the audited pump(s).
- **Fulfilment** – Printed report with full details of the audit results and recommendations.
- **Assessment** – Selection of the right pump solutions for the system based on optimum performance, energy efficiency and cost savings.
- **Follow-up** – Review of the Energy Audit to ensure optimal service delivery and satisfactory pump performance.

Images are for illustration purposes only, and not from actual customer installations.

WHY IS ENERGY OPTIMISATION SO IMPORTANT?

A Grundfos Energy Check or Energy Audit can help you find hidden savings in your organisation. It can identify potential energy savings in your pump installation and help you understand how to save on your pump operating expenses.

95% of the life cycle cost of a pump is related to energy consumption, service and maintenance.

The price of a new pump typically makes up just 5% of the total lifetime cost of operating it. Maintenance accounts for the next 10%, while the remaining 85% are expenses related to running the pump. Life cycle costs are comprised of many contributing factors, however the energy consumption and maintenance are the most important factors to take into consideration.

Upgrading pumps can have other operational, environmental and business benefits as well.

Deciding to invest in greener and more energy efficient pump solutions will boost your environmental profile and bring down carbon emissions. It will also help your organisation to comply with the latest energy saving regulations.

OPERATIONAL **BENEFITS**

- Energy savings
- Reliable operation
- Low failure rates
- Reduced down time
- Reduced repair costs
- Complete overview of pump installations

ENVIRONMENTAL **BENEFITS**

- Reduction in CO_2 emissions
- Greener corporate image
- Pump life-cycle analysis and documentation
- Compliance with energy regulations

Energy
Check

SMALL IMPROVEMENTS. BIG SAVINGS.

By improving or replacing just ten pumps, a leading food manufacturer saved over EUR 29,000 per year.

CASE | **FOOD MANUFACTURING**

Grundfos performed an Energy Check on the pump installations of one of the world's leading food manufacturers and established that even with minor improvements there would be considerable savings.

After inspection of ten pumps, it was found that by investing in more energy-efficient pumps and performing other small improvements there was a potential for savings of EUR 29,344 annually. The savings were owed to a reduction in energy usage by 448,207 kWh per year.

The initial outlay for the equipment and improvements was EUR 132,388.00. When the savings were factored in, the payback time for the optimisation was 3.59 years – with the potential for considerable savings well into the future.

Existing pump	Quantity	Flow (m^3/h)	Head (m)	Operation hours/yr	Potential savings (kWh/yr)	Grundfos replacement
Pumps 1&2	2	270.00	40.00	4380	58,692	NB 100-200/192 + CUE 45kW
Pumps 3&4	2	104.00	16.00	4380	46,515	NBE 80-250/247
Pumps 5&6	2	93.00	11.70	4380	32,412	TPE 100-170/4
Pumps 7&8	2	1,170.00	19.60	4380	276,816	NB 250-350/370 + CUE 90kW
Pumps 9&10	2	154.00	30.00	4380	33,771	NBE 80-200/171

29,344
YEARLY SAVINGS (EUR)

3.59
PAYBACK TIME (YRS)

448,207
ENERGY SAVINGS (kWh/YR)

214
EMISSION REDUCTION (CO_2 T/YR)

132,388
INVESTMENT COST (EUR)

10
NUMBER OF PUMPS ASSESSED

10
NUMBER OF PUMPS WITH POTENTIAL SAVINGS

Energy
Audit

BETTER EFFICIENCY. BETTER PERFORMANCE.

Upgrading to new pumps has significantly improved energy savings and system performance for this water supply station.

CASE | **MUNICIPAL WATER SUPPLY**

A municipal water supply station serving half a population of 140,000 was in dire need of an upgrade. The old inefficient system was suffering from high pressure oscillations (over 1 bar) on the end user side. And there was a high number of network breakdowns leading to frequent water outages.

By switching the existing system from five fixed speed pumps on cascade operation to five NBG 125-80-200/200 pumps working with constant pressure control, the estimated energy consumption was reduced from 358,370 kWh/year to 250,640 kWh/year – a reduction of 30%.

The initial investment for the system (pumps, control cabinet, commissioning, extended warranty, and SCADA integration) was €50,600.

After one year of operation, the customer has already confirmed that the new system has lowered the energy consumption by 30% as initially predicted and that high-pressure oscillations have stopped. In addition, there has been a significant reduction of network breakdowns and water outages.

Existing pump	Quantity	Potential savings (kWh/yr)	Grundfos replacement
Pump 1	5	107,730	NBG 125 80 200/200
Pump 2	1		Control MPC EC + accessories

9,243
YEARLY SAVINGS (EUR)

4.9
PAYBACK TIME (YRS)

107,730
ENERGY SAVINGS (kWh/YR)

76.4
EMISSION REDUCTION (CO_2 T/YR)

50,600
INVESTMENT COST (EUR)

5
NUMBER OF PUMPS ASSESSED

5
NUMBER OF PUMPS WITH POTENTIAL SAVINGS

Energy
Audit

A DEPENDABLE, HIGH-EFFICIENCY SOLUTION.

A new control panel and four new pumps have given this dairy factory peace of mind.

CASE | **DAIRY PRODUCTION**

A dairy factory uses a clean water booster to feed water around the factory. The performance and dependability of this system is critical to the entire production.

Grundfos performed an Energy Audit on one such system. The four-pump solution's control panel was obsolete and one of the pumps had already failed. The customer wanted reliability and peace of mind, and to have the pumps working close to their BEP with lower OPEX costs.

The new system comprised four pumps, installed with cascade operation based on flow demand – duty, assist, assist, assist. The previous system's energy consumption was an estimated 133,240 kWh and the new system's energy consumption is estimated at 80,517 kWh.

Existing pump	Quantity	Potential savings (kWh/yr)	Grundfos replacement
GRUNDFOS CRE 45-2-2, 5.5kW	4	52,723	GRUNDFOS CRE 45 1 1, 5.5kW + CU352 Panel

7,070
YEARLY SAVINGS (EUR)

2.96
PAYBACK TIME (YRS)

52,723
ENERGY SAVINGS (kWh/YR)

12.92
EMISSION REDUCTION (CO_2 T/YR)

20,916
INVESTMENT COST (EUR)

4
NUMBER OF PUMPS ASSESSED

4
NUMBER OF PUMPS WITH POTENTIAL SAVINGS

Energy
Audit

UPGRADING FOR REAL-LIFE NEEDS.

Optimising and increasing the energy efficiency of an iconic water fountain.

CASE | **ENTERTAINMENT & LEISURE**

An iconic water fountain's current system is extremely oversized, as it was designed for an expansion that was never constructed. For the past ten years, the pumps have been operating far from their best efficiency point (BEP), creating significant wear and tear issues due to cavitation. The pumps, even at their lower speed threshold, are over pumping – resulting in a low ΔT syndrome.

The new pumps (TPE 100-390/2 22kW & TPE 100-360/2 18.5 kWh) will optimise operation by matching the real-life needs of the fountain. With the installation of the new pumps, the system is no longer oversized and unbalanced, and saves 39.8% of the previous energy consumption.

The pumps are operating in their BEP range, significantly reducing energy and maintenance costs. The low ΔT syndrome can also be tackled as the over pumping will stop – saving further energy costs.

Existing pump	Quantity	Potential savings (kWh/yr)	Grundfos replacement
Pump 1	1	54,128	TPE 100 390/2, 22 kW
Pump 2	1		TPE 100 360/2, 18,5 kW

5,488
YEARLY SAVINGS (EUR)

3.35
PAYBACK TIME (YRS)

54,128
ENERGY SAVINGS (kWh/YR)

35.84
EMISSION REDUCTION (CO_2 T/YR)

18,404
INVESTMENT COST (EUR)

2
NUMBER OF PUMPS ASSESSED

2
NUMBER OF PUMPS WITH POTENTIAL SAVINGS

Energy
Audit

DOWNTIME DOWN. ENERGY SAVINGS UP.

New pumps have removed water hammer problems and network breakdowns while improving energy.

CASE | **MUNICIPAL WATER SUPPLY**

A municipal water supply station was experiencing recurring water hammer problems when the fixed speed pumps started pumping. This station was also experiencing a high number of network breakdowns and frequent water outages.

The existing solution was replaced with 4 x NK 80-250/234 and a Control MPC-EC. To overcome the high payback time a solution with only Control MPC-EC was presented to the customer.

The updated system is more reliable and easier to control. Occurrences of water hammering have disappeared, and there has also been a significant decrease of network breakdowns, water outages and pipe repairs.

Existing pump	Quantity	Potential savings (kWh/yr)	Grundfos replacement
Pump 1	4	40,410	4x NK 80 250/234 + 1x Control MPC EC + accessories

3,467
YEARLY SAVINGS (EUR)

14.5
PAYBACK TIME (YRS)

40,410
ENERGY SAVINGS (kWh/YR)

28.7
EMISSION REDUCTION (CO_2 T/YR)

80,300
INVESTMENT COST (EUR)

4
NUMBER OF PUMPS ASSESSED

4
NUMBER OF PUMPS WITH POTENTIAL SAVINGS

Energy
Audit

EUR 100,000 EVERY YEAR. PAYBACK TIME OF JUST 2+ YEARS.

A fresh water plant saved over a million kWh per year by replacing 2 pumps.

CASE | **MUNICIPAL WATER SUPPLY**

A fresh water plant's current reverse osmosis solution is running on two conventional high-pressure pumps and a pressure booster/turbocharger on a desalination plant. The existing membrane lines only have an on or off setting.

The new system provides much needed flow and design pressure through the membranes.

The pressure-exchanger is used to recover energy from brine that would have been wasted otherwise. This also enables the plant to decrease the energy requirements for the pumps and thus decrease the overall energy consumption for the osmosis system.

Existing pump	Quantity	Potential savings (kWh/yr)	Grundfos replacement
Pump 1	2	1,031,746	BMS 30-26 HS + BMS 46-4 HP + Isobaric pressure exchanger
Pump 2	2		BMS 46-17 HS + BMS 77-3 HP + Isobaric pressure exchanger

100,658
YEARLY SAVINGS (EUR)

2.38
PAYBACK TIME (YRS)

1,031,746
ENERGY SAVINGS (kWh/YR)

682
EMISSION REDUCTION (CO_2 T/YR)

239,309
INVESTMENT COST (EUR)

4
NUMBER OF PUMPS ASSESSED

4
NUMBER OF PUMPS WITH POTENTIAL SAVINGS

Energy
Check

INCREASED ENERGY SAVINGS. REDUCED CO2 EMISSIONS.

A small upgrade saved a cheese producer energy costs and reduced their emissions – with a payback time of just 0.76 years.

CASE | **FOOD MANUFACTURING**

A cheese producer asked Grundfos to perform an Energy Check on their system to see what size of savings, if any, could be realised by optimising or upgrading.

After performing the check, it was clear that investing in more energy-efficient pumps and other small improvements would reduce energy usage by 306,249.60 kWh per year. Based on the producer's energy costs, this translated to a payback time of just 0.76 years.

Initial outlay for the equipment was € 16,188 (€15,305 in pump equipment costs and 883 in installation/commissioning costs). And upgrading would also reduce the factory's CO2 emissions by 14.09 tonnes of CO2 per year.

Existing pump	Quantity	Flow (m^3/h)	Head (m)	Operation hours/yr	Potential savings (kWh/yr)	Grundfos replacement
Pump 1	1	187.00	46.00	8760	179,580	NK 80-200/211 A2-F-A-E-BQQE + CUE 45 kW+ RPI+T 0-10
Pump 2	1	180.00	22.00	8760	61,582	CUE 3X380-500V IP20 15KW 32A/2+RPI +T 0-6
Pump 3	1	190.00	20.00	8760	65,086	CUE 3X380-500V IP20 15KW 32A/2+RPI +T 0-6

21,437
YEARLY SAVINGS (EUR)

0.76
PAYBACK TIME (YRS)

306,250
ENERGY SAVINGS (kWh/YR)

14.09
EMISSION REDUCTION (CO_2 T/YR)

16,188
INVESTMENT COST (EUR)

3
NUMBER OF PUMPS ASSESSED

3
NUMBER OF PUMPS WITH POTENTIAL SAVINGS

Energy
Check

REDUCED ENERGY CONSUMPTION AND CO2 EMISSIONS

Improving performance and sustainability at a leading chocolate producer.

CASE | **FOOD MANUFACTURING**

An Energy Check showed that a leading chocolate producer could save over € 16,000 per year by replacing 12 of their factory's 14 pumps. In addition to the substantial cost savings, there was also the potential to reduce 57.97 tonnes of CO2 emissions at the factory.

Energy savings from upgrading the pumps was 140,375 kWh per year. The initial investment for the solution was € 60,106 and had a payback time of just 3.05 years. The 10-year savings forecast for the pumps is € 203,442.

Existing pump	Quantity	Operation hours/yr	Potential savings (kWh/yr)	Grundfos replacement
Pump 1	1	4380	32,850	TPE 100-390/2-S AF-A-BQQE
Pump 2	1	4380	32,850	TPE 100-390/2-S AF-A-BQQE
Pump 3	1	8760	2,448	MAGNA3 40-120 F
Pump 4	1	4380	12,045	TPE 50-430/2-S AF-A-BQQE
Pump 5	1	4380	12,045	TPE 50-430/2-S AF-A-BQQE
Pump 6	1	4380	5,825	TPE3 50-240-S A-FA-BQQE
Pump 7	1	4380	5,825	TPE3 50-240-S A-FA-BQQE
Pump 8	1	4380	12,045	TPE 50-430/2-S AF-A-BQQE
Pump 9	1	4380	12,045	TPE 50-430/2-S AF-A-BQQE
Pump 10	1	4380	5,825	TPE3 50-240-S A-FA-BQQE
Pump 11	1	4380	5,825	TPE3 50-240-S A-FA-BQQE
Pump 12	1	8760	744	MAGNA3 25-40 N

16,845
YEARLY SAVINGS (EUR)

3.05
PAYBACK TIME (YRS)

140,375
ENERGY SAVINGS (kWh/YR)

57.97
EMISSION REDUCTION (CO_2 T/YR)

60,106
INVESTMENT COST (EUR)

14
NUMBER OF PUMPS ASSESSED

12
NUMBER OF PUMPS WITH POTENTIAL SAVINGS

Energy
Check

FAST PAYBACK AND INCREASED PERFORMANCE

Upgrading a boiler feed pump saves 90,600 kWh and 37.41 tonnes of CO2 per year.

CASE | **FIBRE MANUFACTURING**

After an Energy Check was performed at a fibre manufacturer having issues with a boiler feed pump, it was estimated that upgrading the pump could deliver savings of over €10,000 per year.

The initial investment for the pump and installation was € 8,000, and would save € 10,872 per year – resulting in a payback time of just 0.69 years. The new pump would also deliver energy savings of 90,600 kWh/year and reduce emissions by 37.41 tonnes per year.

Existing pump	Quantity	Operation hours/yr	Potential savings (kWh/yr)	Grundfos replacement
Boiler feed pump	1	6000	90,600	CRIE 10-17 A-FGJA-E-HQQE

10,872
YEARLY SAVINGS (EUR)

0.69
PAYBACK TIME (YRS)

90,600
ENERGY SAVINGS (kWh/YR)

37.42
EMISSION REDUCTION (CO_2 T/YR)

8000
INVESTMENT COST (EUR)

1
NUMBER OF PUMPS ASSESSED

1
NUMBER OF PUMPS WITH POTENTIAL SAVINGS

Energy
Audit

THE POWER OF A PUMP

By improving a single pump,a large hotel in Dubai could save over 50,596 EUR per year.

CASE | **HOTEL INDUSTRY**

An inspection of a large hotel in Dubai showed that there was a potential to reduce energy usage by 499,581.80 kWh per year by investing in more energy efficiency pumps.

After inspection of the pump that was driving the hotel, it was found that upgrading the pump would result in considerable savings – and would have a relatively short payback time.

The initial outlay for the improvements was 50,596 EUR. The payback time for the equipment optimisation was 2.18 years – with the potential for even more savings well into the future.

Existing pump	Quantity	Operation hours/yr	Potential savings (kWh/yr)	Grundfos replacement
Pump 1	1	8760	499,582	LSV

50,596
YEARLY SAVINGS (EUR)

2.18
PAYBACK TIME (YRS)

499,582
ENERGY SAVINGS (kWh/YR)

328,73
EMISSION REDUCTION (CO_2 T/YR)

110,484
INVESTMENT COST (EUR)

1
NUMBER OF PUMPS ASSESSED

1
NUMBER OF PUMPS WITH POTENTIAL SAVINGS

Energy
Check

ENERGY AND ENVIRONMENTAL SAVINGS.

Upgrading 12 pumps saved a hospital over € 25,000 per year.

CASE | **HOSPITAL**

Grundfos performed an analysis of a hospital's pump installations and found that by upgrading the system there was a potential to save over € 25,000 per year.

After the Energy Check, it was found that the hospital could save € 25,049 per year and save 192,685 kWh per year by simply upgrading 12 pumps.

The investment cost for the system was € 46,788 and had a payback time of just 1.74 years. An added benefit of the upgrade was the reduction of emissions by 72.84 CO2 T/YR, providing a sustainable argument for the system upgrade.

Existing pump	Quantity	Operation hours/yr	Potential savings (kWh/yr)	Grundfos replacement
Pump 1	1	8760	4,715	MAGNA3 40-150 F
Pump 2	1	8760	52,209	NBE 80-160/161 AF2ABQQE + 0-4DPI
Pump 3	1	8760	51,555	NBE 80-160/161 AF2ABQQE + 0-4DPI
Pump 4	1	8760	27,156	TPED 80-250/2 S-AF-A-BQQE-MD1
Pump 5	1	8760	21,900	TPE 80-240/2 S-AF-A-BQQE-LD1
Pump 6	1	8760	6,745	MAGNA3 40-120 F N
Pump 7	1	8760	6,443	MAGNA3 D 50-120 F
Pump 8	1	8760	3,708	MAGNA3 D 40-120 F
Pump 9	1	8760	4,562	MAGNA3 D 50-120 F
Pump 10	1	8760	4,562	MAGNA3 D 50-120 F
Pump 11	1	8760	4,562	MAGNA3 D 50-120 F
Pump 12	1	8760	4,562	MAGNA3 D 50-120 F

25,049
YEARLY SAVINGS (EUR)

1.74
PAYBACK TIME (YRS)

192,685
ENERGY SAVINGS (kWh/YR)

72.84
EMISSION REDUCTION (CO_2 T/YR)

46,788
INVESTMENT COST (EUR)

12
NUMBER OF PUMPS ASSESSED

12
NUMBER OF PUMPS WITH POTENTIAL SAVINGS

Energy
Check

MASSIVE ENERGY SAVINGS. FAST PAYBACK TIME.

A leading international university could save in multiple ways with a pump upgrade.

CASE | **UNIVERSITY**

A Grundfos Energy Check performed at a leading international university showed that there was an opportunity to reduce energy usage and emissions by upgrading 9 pumps.

An analysis of the medical science block at the university showed a potential to reduce emissions by 72.24 CO2 T/YR and deliver a yearly savings of 25,425 EUR by upgrading nine pumps.

The pump upgrade could save 206,978 kWh per year with an initial investment cost of 117,902 EUR. The payback time would be 4.64 years

Existing pump	Quantity	Operation hours/yr	Potential savings (kWh/yr)	Grundfos replacement
Pump 1	1	8760	43,907	TPED 100-250/2 AF-A-BQQE+DPI T 0-4+Coms Card
Pump 2	1	8760	1,392	TPE3 D 50-200-S AF-A-BQQE+Coms Card
Pump 3	1	8760	12,731	TPED 80-330/2-S AF-A-BQQE
Pump 4	1	8760	656	TPED 100-250/2 AF-A-BQQE+DPI T 0-4+Coms Card
Pump 5	1	8760	947	TPE3 D 50-200-S AF-A-BQQE+Coms Card
Pump 6	1	8760	71,455	TPED 80-330/2-S AF-A-BQQE
Pump 7	1	8760	45,098	TPED 100-250/2 AF-A-BQQE+DPI T 0-4+Coms Card
Pump 8	1	8760	11,398	TPED 100-310/2-S A-F-A-BQQE
Pump 9	1	8760	19,389	TPED 80-210/2 A-FA-BQQE+DPI T 0-2.5

25,425
YEARLY SAVINGS (EUR)

4.64
PAYBACK TIME (YRS)

206,978
ENERGY SAVINGS (kWh/YR)

72.24
EMISSION REDUCTION (CO_2 T/YR)

117,902
INVESTMENT COST (EUR)

9
NUMBER OF PUMPS ASSESSED

9
NUMBER OF PUMPS WITH POTENTIAL SAVINGS

ENERGY SAVINGS COMING YOUR WAY?

Contact us, if you want to speak with one of our energy experts about how energy savings can be realised in your building or process plant.

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