

Optimising compressed air improves safety, sparks new line of business

Perardi e Gresino, Italy

Presenter: Dr.-Ing. Elvira Rakova (Direktin, Safen, Italy)

Date: 11-May-2021

PeG overview

PeG specialise in precision mechanical manufacturing in the industrial and automotive industrial sector.

Customers and value proposition

PeG's priority is to produce sustainable, high-precision mechanical components for its customers while ensuring a high level of safety. They also constantly seek opportunities to reduce operating costs.



Optimisation of the compressed air system

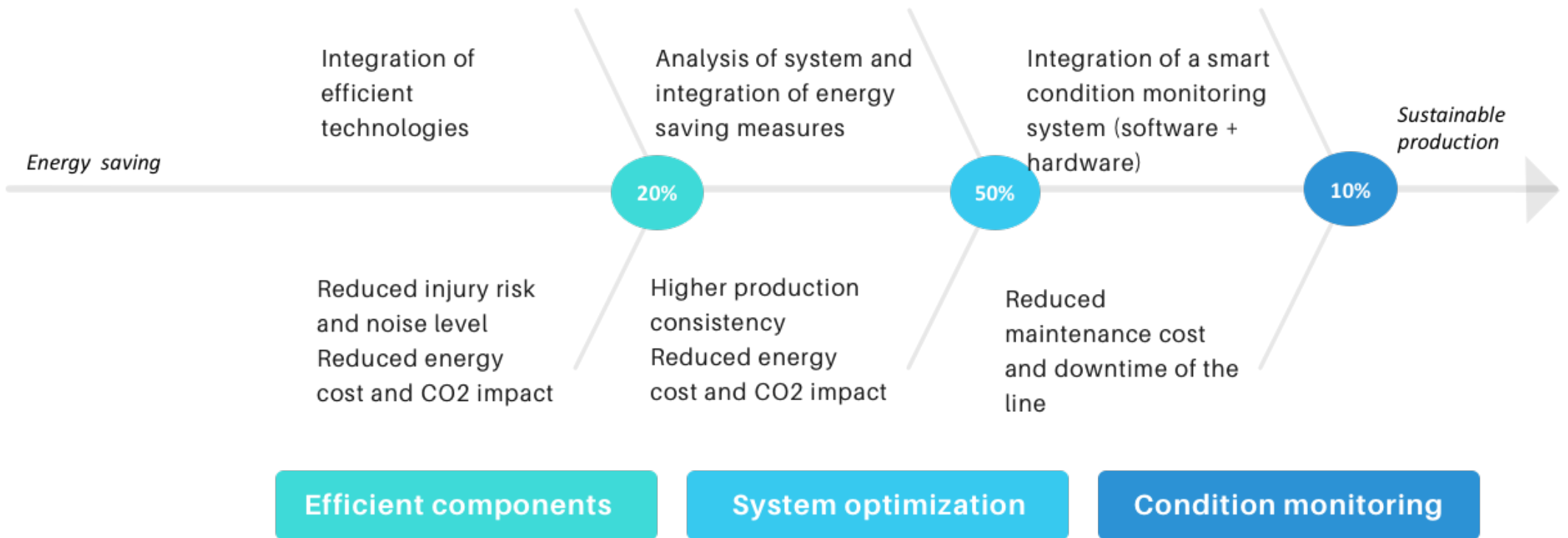
Situational analysis

- Potential energy consumption reduction (80%)
- High noise level
- Time consuming and expensive maintenance
- High risk to insures

Project description

- Reduced energy consumption (80%)
- Reduced noise level (in- and outdoor)
- Increased safety conditions
- Reduced repair time

Multiple benefits of energy efficiency



Energy analysis

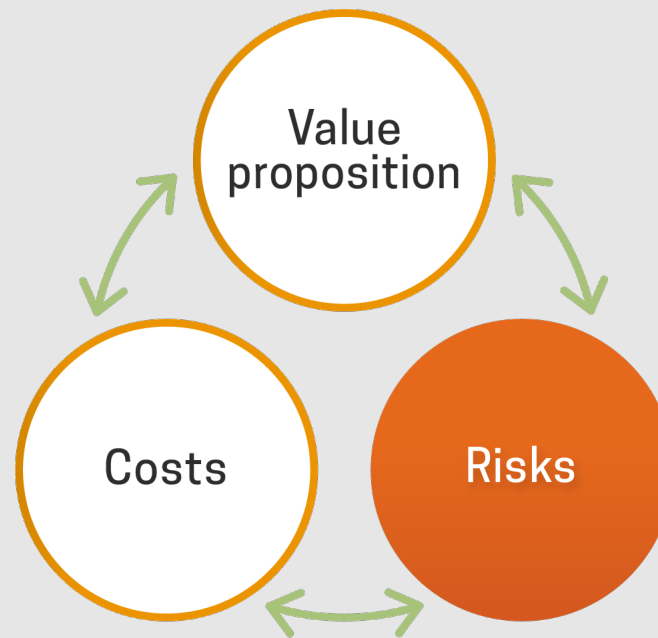
Pre-project

- Compressed air system analysis available
- Noise audit showed that CAS exceeded acceptable noise (from 92dB to 113dB)
- CO₂ impact per product 802g/piece

Post-installation

- **80%** reduction in energy consumption
- **<80dB** achieved noise level
- **107g/piece** achieved CO₂ impact

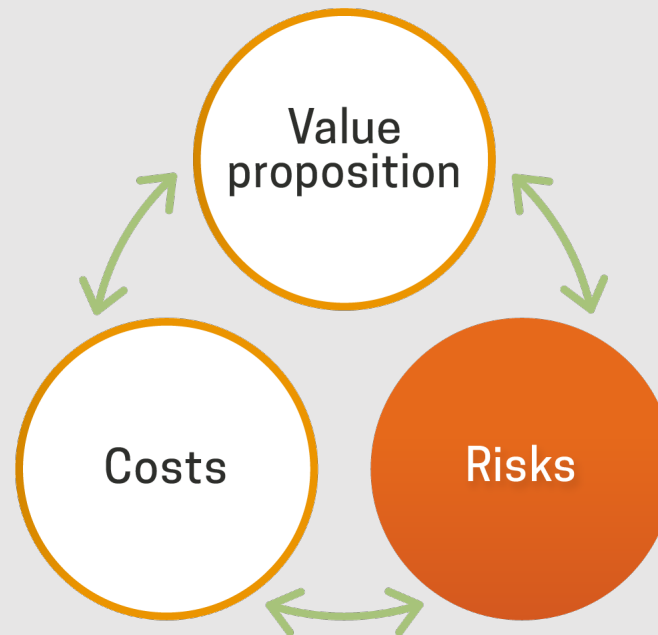
Strategic analysis



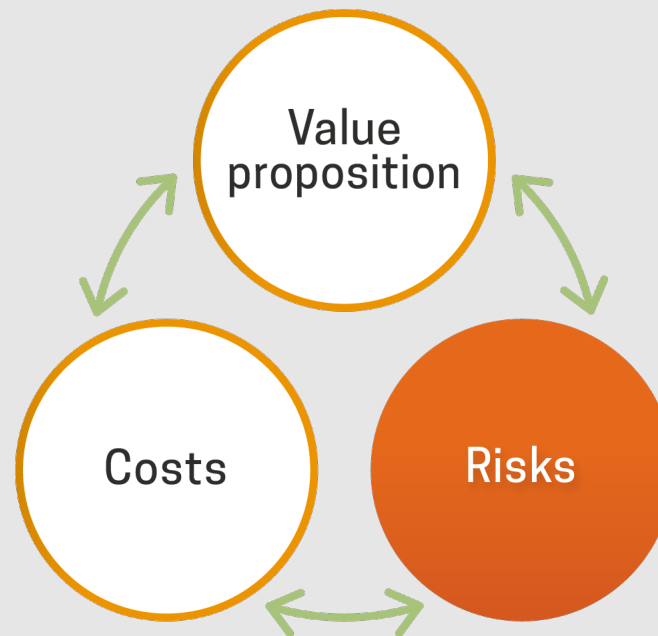
Strategic analysis

Costs:

- Reduced energy costs (80%)
- Reduced maintenance costs (20% of energy cost)
- Lower accident insurance cost (up to 10% of energy cost)



Strategic analysis



Costs:

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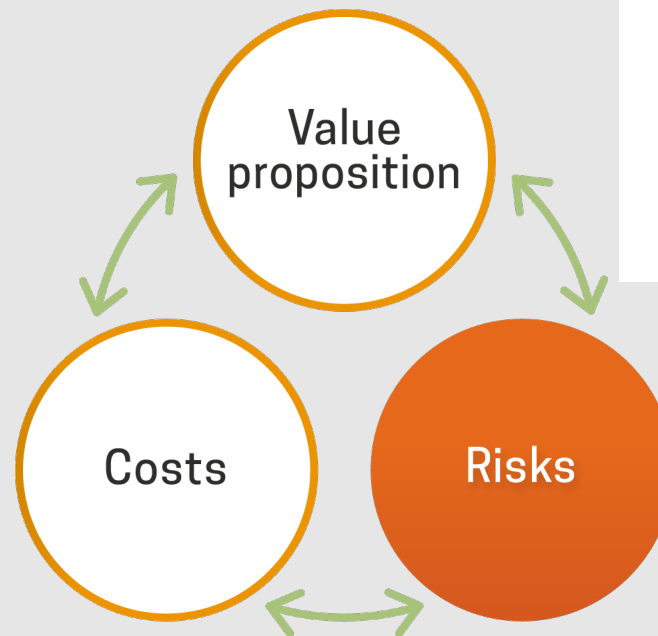
Risks

- Reduced injury risks
- Reduced risk of non-compliance with noise ordinance
- Reduced climate risk
- Reduced risk of regulatory/standards non-compliance (noise)

Strategic analysis

Costs:

- Reduced energy costs (80%)
- Reduced maintenance costs (20% of energy cost)
- Lower accident insurance cost (up to 10% of energy cost)



Value proposition:

- Safer, higher-quality work environment
- Higher production capacity
- Lower carbon products (from 802 g/piece to 107 g/piece)
- Improved product quality and consistency
- New line of business

Risks

- Reduced injury risks
- Reduced risk of non-compliance with noise ordinance
- Reduced climate risk
- Reduced risk of regulatory/standards non-compliance (noise)

Financial analysis

Financial analysis

Note: The multiple benefits quantified in the financial analysis include: Energy savings, Maintenance cost savings (20% of energy savings), Accident insurance cost reduction (10% of energy savings)

	All benefits	Energy-only benefits
CAPEX	Not disclosed	Not disclosed
Simple payback	1,4 years	1,9 years

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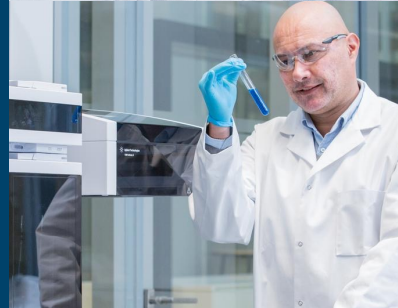
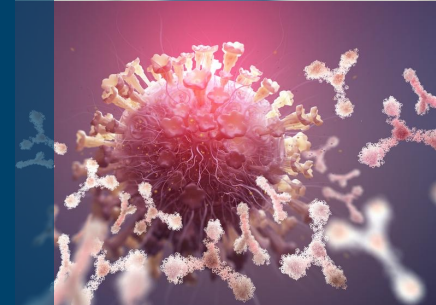
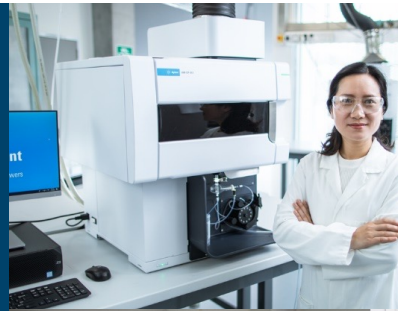
www.mbenefits.eu

Agilent Technologies

Energy Projects 2021
with
Multiple Benefits Methodology
as part of Agilent Technologies \$5M Global Energy Program of 2021

11th May Virtual Conference

 Multiple benefits of energy efficiency



Agilent Germany Energy Projects Site Waldbronn

as part of a Global \$5.4M Energy Efficiency Program in 2021

LED project for building 1 – built in 1978
 LED project for building 4 – built in 2006



HVAC optimization of building 2 – built in 1988
 HVAC optimization of building 1
 - reducing fresh air volume
 - implementing VRV/F system
 HVAC optimization of building 5
 - Reheating system for process exhaust air
 - Connection of AHU's to reduce operation hours
 - HVAC renewal of building 3 – built in 1984

We got approval of 50 % of the WW budget !

PV project on roof of building 4
 PV project on roof of building 5 – built in 2017



Optimization of building management system
 Implementation of energy management system
 - Peak load
 - Managing e-car charging stations
 - Managing and Measuring of energy projects
 - Achieve tax payback
 Power outage concept

Multiple Benefits Methodology



Our Europe Presence Production Sites



1100 employees, ~ 450.000 sqft gross
 Five Buildings, built between 1978 and 2017
 Energy Supply with energy contracting partner EnBW SSG
 6.5 GWh electrical power, 4.4 GWh heating, 2.9 GWh cooling,
 4.500 cbm water, 3800 to CO2 emission,
 \$2.0M energy cost/year excluding the base price for energy plant



Agilent Germany Energy Projects Site Waldbronn

as part of a Global \$5.4M Energy Efficiency Program in 2021

LED project for building 1 – built in 1978
 LED project for building 4 – built in 2006



Invest \$0.4M

Multiple Benefits based on ROI < 7 yrs

- Better work environment
- Less CO2 calculated – 20 %
- Less business disruptions
- Postpones a new building demand for further 5 to 7 years
- Motivation of employees to work for Agilent
- Less sickness dates
- Higher productivity

PV project on roof of building 4
 PV project on roof of building 5 – built in 2017



Invest \$0.67 M

Capital Investment	\$2.77M
Annual Cash Savings	\$0.46M
Advantage	Up to €200k grant from German government (* not included)
ROI (ave)	5,7 years
OP Savings	\$27K
Environmental impact	790 to CO ₂

HVAC optimization of building 2 – built in 1988
 HVAC optimization of building 1
 - reducing fresh air volume
 - implementing VRV/F system
 HVAC optimization of building 5
 - Reheating system for process exhaust air
 Connection of AHU's to reduce operation hours
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Optimization of building management system

Implementation of energy management system
 - Peak load
 - Managing e-car charging stations
 - Managing and Measuring of energy projects
 - Achieve tax payback



Invest \$1.65M

Power outage concept

Current situation and weaknesses:

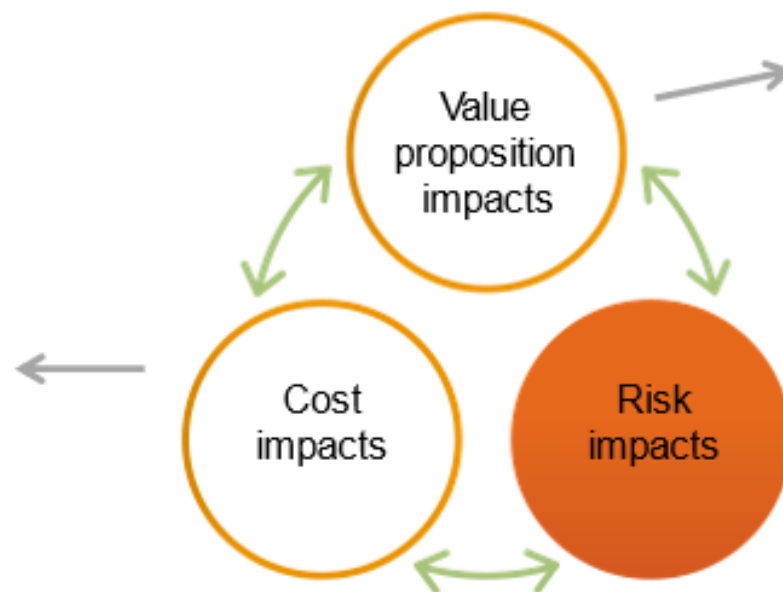
- Building 3 HVAC needs urgent upgrade because of safety purposes
- Risks of disruptions are increasing
- Pandemic requires good ventilation

Energy-efficiency measure(s) proposed and advantages:

- New efficient ventilation
- Installation of decentral VRV units
- Installation of a heat recovery
- Installation of central district heating and cooling

Strategic analysis

- Additional space / Improved space utilization
- Postponed Investment to 5 - 7 years
- Reduced CO2 emissions
- Reduced maintenance cost
- Air quality improvement of ambient air
- Improved staff satisfaction and loyalty



█ - quantified

- comfortable environment and air quality for training, sales, marketing and R&D activities
- Safe ventilation and health standards
- Additional space for OF, R&D, Marketing and sales means improved customer relationship and more space to increase revenues
- Reduced risk occupational disease
- Reduced risk of disruption of HVAC

Agilent Germany Energy Projects Site Waldbronn as part of a Global \$5.4M Energy Efficiency Program in 2021

WAD AHU B3 Project: Air Handler Unit Replacement & Safe Building 3 Usage

Project Description

- Building 3 (WAC) built in 1984 needs urgent upgrade to safely use building for minimum further 10+ years. Risks of obsolescence are increasing.
- In 2014 local VPE did provide a site inspection with new building 3 and future space demand with existing building 3.7 floor for CE and future usage of building 3 before demolishing and a new construction for future site growth.
- End of 2020 driven by the Corona pandemic local VPE recommends following:
 - Replace AHU (of 2000 m³/h) with an energy efficient new 10,000 m³/h unit because of EOL, air recirculation, corrosion, reduced the filter, local rising energy costs and high rate of outages.
 - Installation of decentral VPE units for specific heat load, connection of heating and cooling to heating / domestic water (HW) and boiler (new gas).
- Project should be done in 2021 because of ongoing space demand from OP (D printing, Cleanroom, Test/Debug) / R&D (New VPE, design & development, QS& customer project, new Marketing video room) and Sales (EPSC, repairs, add. CEE re-branding).
- \$27K as part of energy project with ROI of 6.7 years
- Enable to split development projects with operational savings of 5.8 kWh/m²/h from location 50, 3000 m³/h (unit 1) to 10,000 m³/h (unit 2) AHU, avoid 1200 kWh/m²/h (unit 1) avoid
- Go to 100% safety first customer government \$20k for energy efficiency projects
- Execution between March and May 2021 (see building 3 AHU project in 2019)

Environmental & Multiple Benefits

- Reduction of 182 t CO₂/year
- Operational and usable building for further 6 to 7 years
- Project provides additional new building and investment of 2000k for further 6 to 7 years, additional cost compared to existing building 3.7 floor (new building)
- B3 space further usable to reorganize site regarding Corona warnings (over space)
- Full Space Replaces from OP, R&D and Sales functions
- High likelihood of the size of investment in 6 to 7 yrs. in new building

Additional demand of \$20k will be funded either with government subsidy or/and out of rebranding project budget

Capital Investment	\$327K
Annual Cash Savings	\$50K
NPV	\$38K
ROI	6.7 years
OP	\$27K
Environmental Impact	152 t CO ₂

Air Handling units optimization

Reduce of air flow from outside Improve Re-Heating Systems

Implement decentral cooling units

What and why



WAD B5 AHU project: Re-heat System & Air supply optimization

Project Description

- Operation of building 5 shows that exhaust air flow is higher, and minor loaded with hazardous gases. Return and fresh air is lower and therefore installed heat recovery system is less efficient than initially planned.
- 2 Heat exchangers can be installed and connected with available reheating units (1)
- Connection of AHU1 with AHU2 and AHU3 with AHU4 (2)
- Save energy lost of 14,700 m³/h exhaust air flow
- Reduce high temp heating in winter and cooling demand in summer period

Environmental & Multiple Benefits

- Reduction of 48 t CO₂/year
- Less operation and maintenance cost
- Best top solution in case of breaks and maintenance work
- Result & Recommendation of E.U. & German Energy Audit in year 2019 (EOL-G)

Implementation Plan

- Execution Period: Q2
- M&V: Measure & calculation
- Connection of AHU's: AHU1 with AHU2 and AHU3 with AHU4 (2)
- Each duct for 20,000 m³/h

Based on the 3-year operating experience (EBS)

(1) Two new heat exchanger for AHU1 and AHU3

Capital Investment	\$196k
Annual Cash Savings	\$52k
NPV	\$463k
ROI	3.75
OP	\$11k
Environmental Impact	48 t CO ₂

WAD AHU B1 and B2 Basement Project: Air supply optimization

B1 Project Description

- As a follow-up project to the B201 upgrade to P121 we recommend to further optimize the air flow supply system of the complex building.
- Customize the air flow supply for the 5 floors.
- Each floor (Basement, ground floor & 3rd floor) has the own special air flow request & operating conditions.
- Implement air recirculation units (pepa filters) on ground floor on top floor for OP.
- Improve the Heat Recovery in the basement
- Improve the air supply & quality implementing customised zone controls.
- Calculated possible air flow reduction: -80,000 m³/h (significant cost saving potential at the low central AHU)

B2 Basement Project Description

- Follow-up project to the new AHU installation: In P115 below Air Handling Units (AHUs) were implemented (instead of the old central AHU) by which the air supply of the ground floor and 3rd floor basement could be increased. On the other hand was -80,000 m³/h less air flow volume is currently needed (generally with savings). The ground floor was result to the CEE.
- We recommend to optimise the air flow supply on the basement (secondary side saving).
- Establish 20 air zones & implement 15 Air recirculation units (pepa filters) for OP.
- Improve the air supply & quality via customised zone controls.
- Calculated possible air flow reduction: -20,000 m³/h

Project status: Feasibility calculation (scope: control method & implementation cost etc) was made by CEE & Engineering Company FC Group

Proposed next steps:

- Prepare the implementation in Q1-Q2 of P121
- Implementation in Q3-Q4 of P121
- M&V: Mix of measurement & calculation

Environmental & Multiple Benefits

- Reduction of 311 t CO₂/year
- Higher air supply quality can lead to:
 - Better working environment & employee satisfaction & less absence days
 - Higher productivity

AHU Opt B1 & B2	
Capital Investment	\$788k
Annual Cash Savings	\$164k
NPV	\$590K
ROI	4.5 years
OP	\$111K
Environmental Impact	311 t CO ₂

Better health standards Decentral cooling units with high quality filter (Hepa-14)

Environmental & Multiple Benefits

Financials (ROI, NPV, IRR, CO₂)

Agilent Germany Energy Projects Site Waldbronn as part of a Global \$5.4M Energy Efficiency Program in 2021

Building Management System Optimization

WAD BMS Project: BMS Optimization

Project Description

- Follow-up project of BMS System expansions in the recent years:
 - Site has started BMS system upgrades 6 years ago B4 and B1 were already renewed, B2 partially with new AHU in 2019
- We recommend to develop further the current BMS systems on the following areas:
 - Improve the Energy Management System (in order to enable ~34,000 USD/year Energy and electricity tax refund)
 - Improve the Alarm Management (in order to realize / discover earlier the different system anomalies)
 - Improve the Reporting System (in order to be able to make better & faster decisions at operation level)
- Calculated Extra Cost (in order to maintain the System continuously): ~11,000 USD/year
- The Project is ready for implementation (scope is clarified; subcontractor offers / project costs are available)
- Result & Recommendation of EU & German Energy Audit in 2019 (EDL-G)
- Implementation could be started immediately and executed Q1-Q4 of FY22



M&V: BMS system helps to measure and monitor energy efficiency projects!

Environmental & Multiple Benefits

- Reduction of 16 t CO2 / year
- Enable State of Art BMS System which can also utilise:
 - The Big Data Management
 - The Smart Rules

Step into the Energy / BMS 4.0. Link with Industry 4.0 possible

BMS Opt	
Capital Investment	\$266k
Annual Cash Savings	\$41k
NPV	\$213k
ROI	5,5 years
OP	\$26k
Environmental impact	16 t CO ₂

Get Data !

Measure consumption to get refund from government !

What you measure – you can control !



WAD Site Power Outage Mitigation Plant

Project Description

- Site Waldbronn was impacted by various minor power outages in 2018 and 2019
- WPS WW management asked local WPS to evaluate a solution to minimize risks to OI and other important areas and infrastructure
- WPS investigated a solution to mitigate outages
 - > 15 seconds
 - > 15 seconds to 15 minutes
 - > 15 minutes up to X hours
- System to store PV and CHP power; support e-car charging stations

For further investigation (only)
Estimated investment 2 to 3 M€

Environmental & Multiple Benefits

- Reduction of business disruptions
- Outages up to 15 minutes will become zero disruptions
- Outages > 15 minutes depending on duration
- No or only minor hardware damages
- Less emergency responds after an outage
- No disruptions to customer training, demo center, production, R&D test areas
- Disruption to office building, B4, B3 and priority 2 areas, if needed
- If emergency system can provide up to 2 MW – no disruptions on site!

Implementation Plan

- Final investigation to get project budget defined
- If approved in Q2 2021 then start mid of 2021
- major work which needs power outage
- Planned Site outage 1st weekend in April 2022
- Project closure Mai 2022

WAD site turnover > \$1.0 M per workday

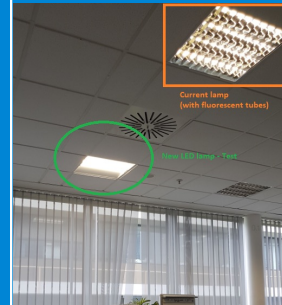
Site Power Outage	
Capital Investment (Design Cost)	\$110k
Annual Cash Savings	
NPV	
ROI	
Simple Payback	
Environmental impact	

Feasibility Study is already available

Agilent Germany Energy Projects Site Waldbronn

as part of a Global \$5.4M Energy Efficiency Program in 2021

LED projects



Today



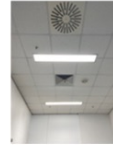
NEW

WAD LED Project: B4 office and B1 Grd floor / OF areas

Project Description

- B4 office areas:** replace standard fluorescent tubes lighting elements with LED panels, as already implemented in areas of B2. See image on right.
 - Approximately 700 fixtures with new LED panels = creating zones with presence control. Achievable reduction in electricity consumption: ~70%
 - Further Benefits of renewing B4 office lighting / tubes with LED lights:
 - ~\$2.5k OP Saving (~50 hours/year less repair & maintenance work)
- B1 Ground Floor:** replace existing lighting systems with LED. See image on right.
 - Further Benefits of renewing B1 lighting / tubes with LED lights:
 - ~\$5.6k OP Saving as the proposed LED project makes the already postponed fluorescent tube replacement unnecessary
 - ~\$3.1k OP Saving (~80 hours/year less repair & maintenance work)
 - The Project is ready for implementation (Scope is clarified; subcontractor offers & project costs are available)
- Result & Recommendation: of EU & German Energy Audit in 2019 (EDL-G)

B2 – New LED 2020



B4 – Office area



LED B1 & B4	
Capital Investment	\$388K
Annual Cash Savings	\$64K
NPV	\$106K
ROI (energy only)	6.6
Annual OP Savings	\$5.6K
Environmental impact	113 t CO ₂

Environmental & Multiple Benefits

- Reduction of 113 t CO₂ / year
- Reduced operational and maintenance cost to replace tubes each 4 yrs.
- Better lighting quality can lead to:
 - Better working environment & higher employee satisfaction = Higher productivity

Energy Efficient
Better Workplace

“Control units are a cost risk”



Agilent Germany Energy Projects Site Waldbronn as part of a Global \$5.4M Energy Efficiency Program in 2021

PV projects



WAD PV Project: B4 & B5 Photovoltaic Project

Project Description

- WAD site has many years of experience with solar energy. PV with 250 kWp has been installed on roof of B1 and B2. Feed to grid.
- We recommend to implement further PV System at roof of B4 & B5:
 - Planned new capacity: 154 + 158 kWp (790 modules)
 - The e-power will be locally used by WAD site. No feed to grid. (source 1 of the calculated cost saving)
 - The additional power capacity will reduce the Peak Load of min. 150kW (source 2 of the calculated cost saving)
- Feasibility was made by CBRE & Engineering Company FC Gruppe (scope, power capacity & implementation cost)
- Result & Recommendation of EU & German Energy Audit in 2019.(EDL-G)



PV B4 and B5	
Capital Investment	\$666K
Annual Cash Savings	\$98K
NPV	\$249K
ROI	6,8 years
OP	\$53K
Environmental impact	150 t CO ₂

Environmental & Multiple Benefits

- Reduction of 150 t CO₂ / year
- Solar energy has still a key role in the regenerative energy market
- Higher employees commitment & satisfaction
- Feeds future e-car charging stations with green power

790 modules with 312 kWp
Reduction of electrical power from grid
(300.000 kWh/yr; ~5 % of total power usage ,
100 % self-consumption)
Usage for e-car charging
Further Reduction of power peak value

Step 4– Financial impacts

Financial analysis

Energy benefits only

- CAPEX:575.000 €
- NPV: 543.000 €
- IRR:18 %
- Simple payback:6 years

All benefits without postponed investment

- CAPEX: 575.000 €
- NPV: 1.220.000 €
- IRR:37 %
- Simple payback:3 years

All benefits with postponed investment

- CAPEX: 575.000 €
- NPV: 6.800.000 €
- IRR: 1720 %
- Simple payback:1 years

Discount rate:2 %

Investment duration: 15 years (i.e. the number of years taken into account to compute NPV and IRR)

Impact from strategic multiple benefits from these projects on:

Reduce costs/Increase competitiveness	Increase value proposition	Reduce crucial Risks
Reduce hazardous waste costs	Contribute climate neutrality goals	Improve employee safety
Decrease O&M & technical control costs	Improve image & marketing of our products	Reduce legal risks (health/compliance)
Reduce CO2 costs from Gas burning	Improve operations of OF 3D Printing and R&D Sales	Keep relationship with German Government/Karlsruhe city
Increase employee visual comfort	Use of German Funding 200k€	Reduce business disruptions
Increase employee well-being	Leading role in using renewables	Reduction of hardware damages
Increase in productivity/less absenteeism	Train Energy Manager on Multiple Benefits	
Reduce demand for heating and cooling in summer and winter	No disruption of trainings/R&D?	
Use B3 for 5-7 years delays investment		
Reduce emergency responses for outages		

Quantifiable Benefits

Measure, Estimate, Forecast, Calculate, Use Techn. Specifications,...



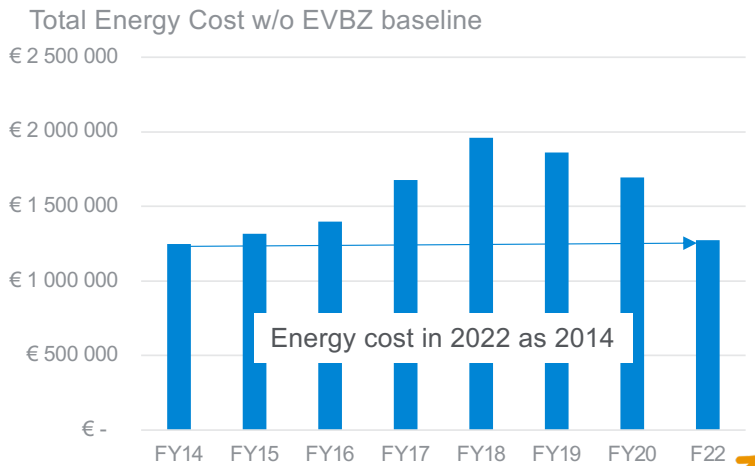
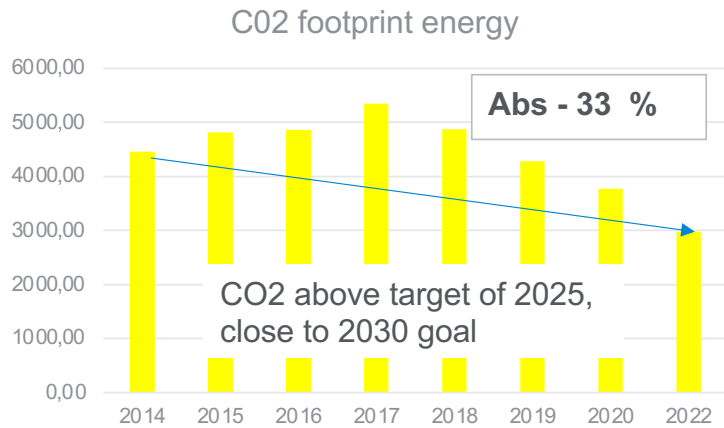
Agilent Energy Project Outcome

Lessons learned

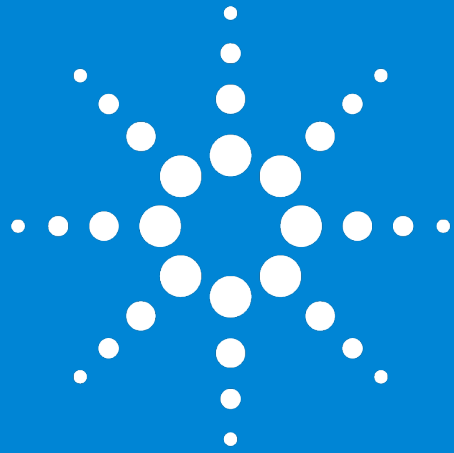
- An Energy project with ROI more than 4 years needs additional benefits
- Management likes to see operational, environmental and/or social aspects & financial returns
- Multiple Benefits Methodology enables the deep dive and the evaluation of processes
- Multiple Benefits Methodology is a great tool to optimize the process and summarize the outcome

Key Challenges

- Quantification of the benefits is mostly hard
- Execution of the approved projects in 2021
- Commitment to achieve the savings in 2022



Thank You!



Agilent

Trusted Answers

Safe Harbor

This presentation contains forward-looking statements (including, without limitation, information and future guidance on the company's goals, priorities, growth opportunities, customer service and innovation plans, new product introductions, financial condition and considerations, and the continued strengths and expected growth of the markets the company sells into, operations) that involve risks and uncertainties that could cause results of Agilent to differ materially from management's current expectations. The words "anticipate," "plan," "estimate," "expect," "intend," "will," "should" "forecast" "project" and similar expressions, as they relate to the company, are intended to identify forward-looking statements.

In addition, other risks that the company faces in running its operations include the ability to execute successfully through business cycles; the ability to successfully adapt its cost structures to continuing changes in business conditions; ongoing competitive, pricing and gross margin pressures; the risk that our strategic and cost-cutting initiatives will impair our ability to develop products and remain competitive and to operate effectively; the impact of geopolitical uncertainties on our markets and our ability to conduct business; the impact of currency exchange rates on our financial results; the ability to improve asset performance to adapt to changes in demand; the ability to successfully introduce new products at the right time, price and mix, the effects of the public health crisis worldwide and other risks detailed in the company's filings with the Securities and Exchange Commission, including our quarterly report on Form 10-Q for the quarter ended July 31, 2020. The company assumes no obligation to update the information in this presentation.



Multiple benefits of energy efficiency

Pilot study:

Implementation of an advanced artificial intelligence controller for air conditioning system

Margherita Cumani
Energy Management HERA S.p.A

11th May 2021 - virtual conference





SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD

A major Italian multi-utility
offering primary local services to

citizens
WASTE MANAGEMENT SERVICES

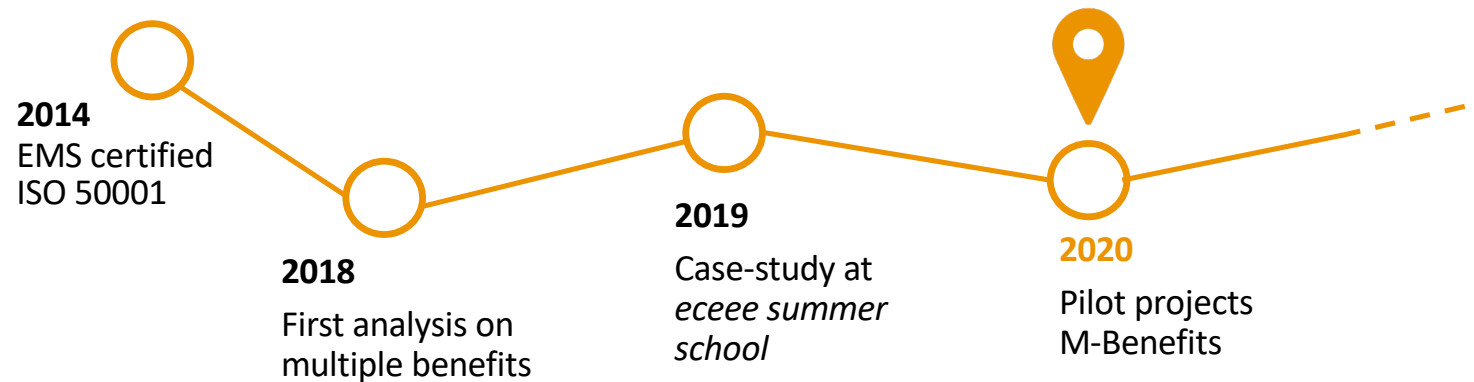


ISO 50001 *Save Energy*
Sistema Gestione Energia Gruppo Hera



FEDERAZIONE ITALIANA PER
L'USO RAZIONALE DELL'ENERGIA

WHY



A path of increasing awareness

- Multiple Benefits analysis **crucial to better understand** the complexity of businesses
- **Speaking the same language** as process owner and decision makers

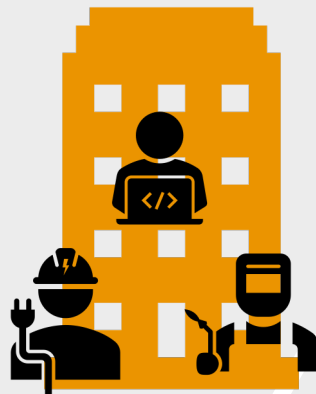


WHO

Decision maker: Facility Manager



Customers: employees



Value proposition
Excellence, efficiency,
safety, quality, innovation

«make people feel good»

WHER

Ravenna headquarters
warehouse and workshop building



Traditional air conditioning system (both heating&cooling)



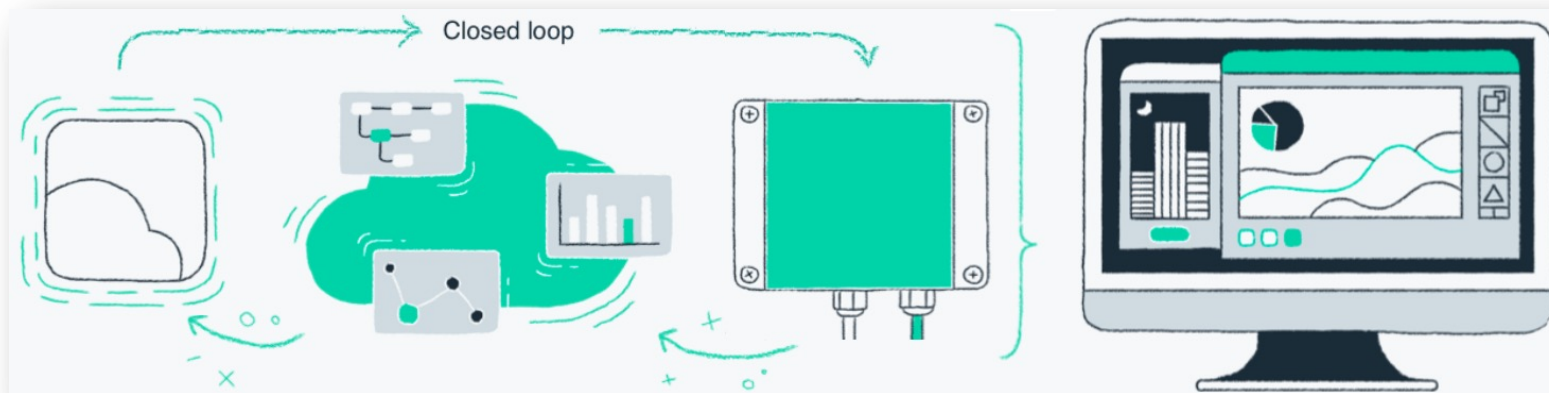
Limited or absent automation



Manual control of terminals

WHAT

Advanced automation and control system based on Artificial Intelligence (AI) technologies, capable of **integrating a large number data** from the field and implementing predictive and multi-variable **optimization logics**.



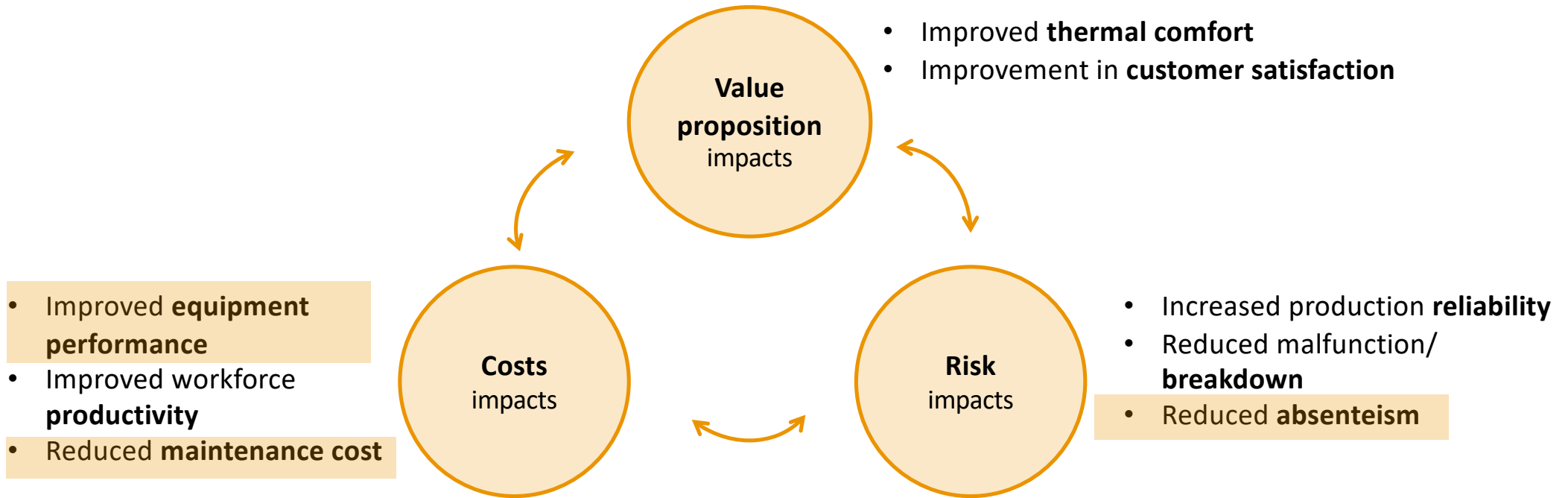
- Detailed monitoring
- Efficient production
- Efficient distribution

ENERGY EFFICIENCY

Source: www.enerbrain.com

Strategic impacts

Quantified economic impacts



Strategic impacts

Quantified economic impacts



Improved **equipment performance**



Reduced **maintenance cost**



Reduced **absenteeism**

Analyzed parameters

- Electricity & Nat.Gas **consumptions**
- €/kWh, €/Smc

- **n° of tickets** for discomfort or malfunctioning (2019)
- €/ticket for resolution

- Days of **absences for illness** (2018/19 Ravenna headquarters)
- €/day of absence

Target (expected)

- 30%

- 70%

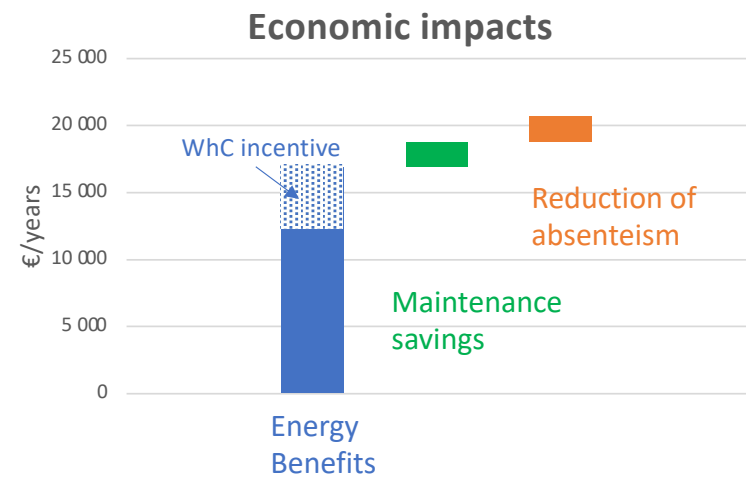
Aligned with the best internal rate of absenteeism



Economics

	Energy only	All Benefits	
CAPEX	32'000 €	32'000 €	
NPV*	43'600	63'300	
IRR _{10y} *	29,7%	38,9%	
Annual cashflow*	10'270 €	12'900 €	+20%
Disc. Payback time*	3,5 years	2,8 years	< 3 years

* Discount rate: 6%
Investment duration: 10 years





TAKE AWAY

- Limited building size and n° occupants → **more attractive potential for larger and more populated buildings**
- Economic impacts of Multiple Benefits → less relevant than energy saving but **not negligible**
- Financial analysis including all benefits → **20% increase in annual cashflow** and discounted **payback time < 3 years**
- Further analysis → **quantification of increase in occupants' productivity** (only qualitatively assessed in this pilot)

Thank you for your attention

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