

Including the non-energy benefits of energy efficiency in the investment assessment and decision-making process

Pilot assessment M-Benefits

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1

Pilot assessment M-Benefits

IND-10

JOWA

Sant'Antonino

Centralized Cooling
Production

M-Benefits analysis carried out by HSLU (Dr Ingo Schneider), in collaboration with JOWA's Industrial Refrigeration Project Manager, who approved this presentation. We would like to thank JOWA and the MIGROS industrial group for their collaboration on the M-Benefits research project.

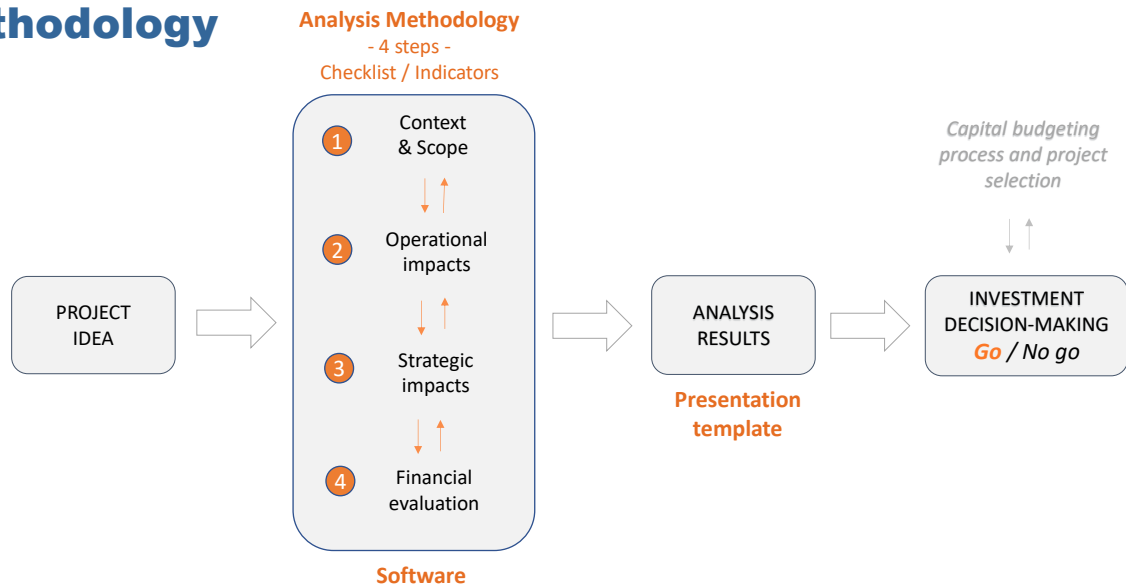


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 786131. This document only reflects the authors' views and EASME is not responsible for any use that may be made of the information it contains.

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2

Analysis Methodology

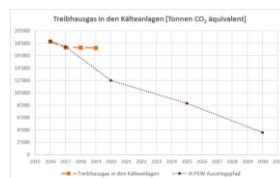


3

Step 1 – Project & Scope

Current situation and weaknesses:

- System age: 19 refrigeration plants using HFC refrigerants (some from the 1970s) supply various cold consumers (fermentation cells, freezer rooms, warehouses).
- Operational safety: Recurring leakages in the plants (Gärstoppzellen) with production downtimes due to repairs, spare parts supply not secured.
- Legal requirements: From 2030, cooling agents (GWP > 2500) are not allowed to be re-filled in the 8 refrigeration systems.
- The existing (decentralised) refrigeration system (ChemRRV, capacity > 30kW) would have to be replaced for the extension of a freezer room.
- Refrigerant strategy: Refrigerant in use with total GWP = 1'800 t CO₂eq (St. Antonio site)



4

Step 1 – Project & Scope

Centralized Cooling Concept and benefits:

- Centralised cooling system (CO2 refrigerant) with high reliability and built-in redundancy.
- Almost 100% implementation of cooling strategy on site.
- Waste heat recovery reduces gas and oil consumption.
- Reduced unplanned production downtime (due to repairs).
- Allows a refrigeration chamber to be enlarged.
- Avoids investment (change of refrigerant, air conditioning).
- Reduces power and maintenance costs.

5

Step 1 – Company analysis

JOWA :

- 3,200 employees, part of the Migros Industrie Group.
- The JOWA bakery in St. Antonio produces a variety of part-baked frozen breads and Panettone cakes.

Customer segment and value proposition:

- Customers: Migros cooperatives and a number of Swiss discounters.
- Value proposition: Customer proximity thanks to "home bakeries". "Daily freshness", "The best quality at the best price".

6

Step 2 - Energy & Operations

Energy analysis

Current energy consumption:

- Energy sources affected by the energy-efficiency measure: Electricity, natural gas, heating oil.
- Total consumption of equipment impacted by the EEM (2019): Electricity 1,8 GWh/year; natural gas 2,6 GWh/year; heating oil 6,500 kWh/year.

Future energy consumption (i.e. after project implementation):

- Estimated gas and oil savings for all equipment: 200,000 kWh/year (plus waste heat recovery for multiple uses: 100,000 kWh/year)
- Estimated monetary savings (energy only): CHF 30,000/year
- Reduction in total site consumption: 4.30%.
- 6.50% reduction including gas and oil savings from waste heat recovery.

7

Step 2 - Energy & Operations

Operational Analysis – Expected project impacts on operational excellence:

THE 4
DIMENSIONS
of
OPERATIONAL
EXCELLENCE

- **Safety:** Improved employee safety thanks to better control.
- **Quality:** Reduction in non-quality and unplanned production downtime.
- **Costs:** Reduced cost of non-quality and unplanned downtime; maintenance and storage costs; energy and CO2 costs.
- **Time:** More time for production thanks to less unplanned downtime.

Safety

Quality

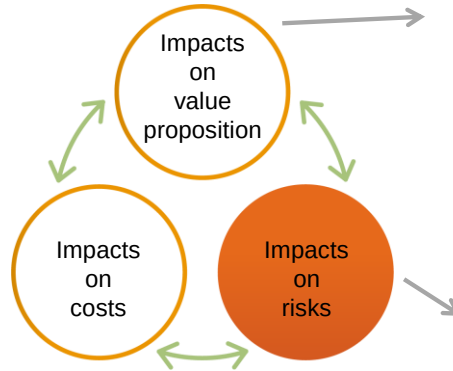
Costs

Time

8

Value-Costs-Risks analysis

NEBs monetised and included in financial valuation



Step 3 – Strategic Analysis

- CAPEX reduced or deferred
- Lower maintenance cost
- Reduced machine and equipment failures and downtime
- Reduced cost of unplanned production stoppages
- Reduced external storage costs
- Increased use of waste heat
- Reduced energy costs
- CO2 emissions and cost reduced

- Improved product quality and consistency
- Enhanced regulatory compliance
- Increased employee satisfaction and loyalty
- Improved image thanks to reduced CO2 and refrigerant gas emissions
- Positive contribution to the company's vision and strategy
- Reduced risk of drifting (better control)
- Lower risk of breakdown
- Risk of unscheduled production stoppages down
- Lower energy & CO2 risk
- Lower climate risk (reduction in fluorinated gas emissions)

9

Detailed financial calculations

Step 4 – Financial analysis

Total annual **energy** benefits
(investment in-flow)

TOTAL ENERGY COST REDUCTION IN CHF				Year 0	Year 1	Year 2	Year 3
				0	28 950	28 950	28 950
NON-ENERGY BENEFITS (NEBs)							
NON-ENERGY BENEFITS	Amount in CHF	Start period	Duration	Year 0	Year 1	Year 2	Year 3
Repair+failure (overtime)	13 000	Year 1	Recurrent	0	13 000	13 000	13 000
Avoided investment (air-conditioning 2024 not)	260 000	Year 4	Non recurrent	0	0	0	0
Storage costs	15 000	Year 1	Recurrent	0	15 000	15 000	15 000
Legal regulations (avoidance of change of refrigeration	20 000	Year 1	Non recurrent	0	20 000	0	0
Legal regulations (avoidance of change of refrigeration	20 000	Year 3	Non recurrent	0	0	0	20 000
Legal regulations (avoidance of change of refrigeration	20 000	Year 5	Non recurrent	0	0	0	0
Legal regulations (avoidance of change of refrigeration	20 000	Year 7	Non recurrent	0	0	0	0
Legal regulations (avoidance of change of refrigeration	20 000	Year 9	Non recurrent	0	0	0	0
Enlarged batch (reduction of set-up time)	30 000	Year 1	Recurrent	0	30 000	30 000	30 000
Maintenance costs (centralization instead of 19 systems)	10 000	Year 1	Recurrent	0	10 000	10 000	10 000
Waste heat utilization	8 000	Year 1	Recurrent	0	8 000	8 000	8 000
TOTAL NON-ENERGY COST REDUCTION IN CHF				Year 0	Year 1	Year 2	Year 3
				0	96 000	76 000	96 000

Total annual **non-energy** benefits
(investment in-flow)

10

Step 4 – Financial analysis

Financial analysis

Energy benefits (EBs) only:

- CAPEX : ----- * CHF
- Annual investment in-flow: 28'950 CHF
- NPV: -645'652 CHF
- IRR: -8.53 %
- Simple payback: 32.9 years

All benefits (EBs + NEBs):

- CAPEX : ----- * CHF
- Annual investment in-flow: 124'950 CHF (1st year)
- NPV: 19'430 CHF
- IRR: 9.42 %
- Simple payback: 8.3 years

Discount rate : -- *

Investment duration: 15 years (= number of years used to calculate NPV and IRR).

* = Not disclosed due to confidentiality

11

Conclusion

Why this project is worthwhile:

- Safety of staff improved.
- Operational and financial efficiency
 - Reduced non-quality and production disorganisation.
 - Reduced cost of poor quality and unplanned downtime.
 - Greater storage space (avoiding off-site storage, larger production batches).
 - Reduced future CAPEX requirements.
- Strategic impacts
 - Product quality and stability, employee retention, regulatory compliance.
 - Contribution to the climate change strategy.
 - Reduction of serious risks.

12