Energy Performance Contracting Plus

Technical Toolbox for Technical Measures for use in SPIN-constellations

Energy-efficient pumps

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www.epcplus.org

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Content

1. General description and explanation how-to-use

EPC+ aims at standardizing technical measures in order to make them predictable for other SPIN members (including the SPIN coordinator) and thereby to reduce transaction costs.

The toolbox can serve as a guide for the providers of EPC+-services for the standardization of the measures (design parameters, calculation method, process flow) and defines quality standards for the M&V-method. Text-modules of the descriptions may also be used for the communication with the client in order to create trust into the proposed measures.

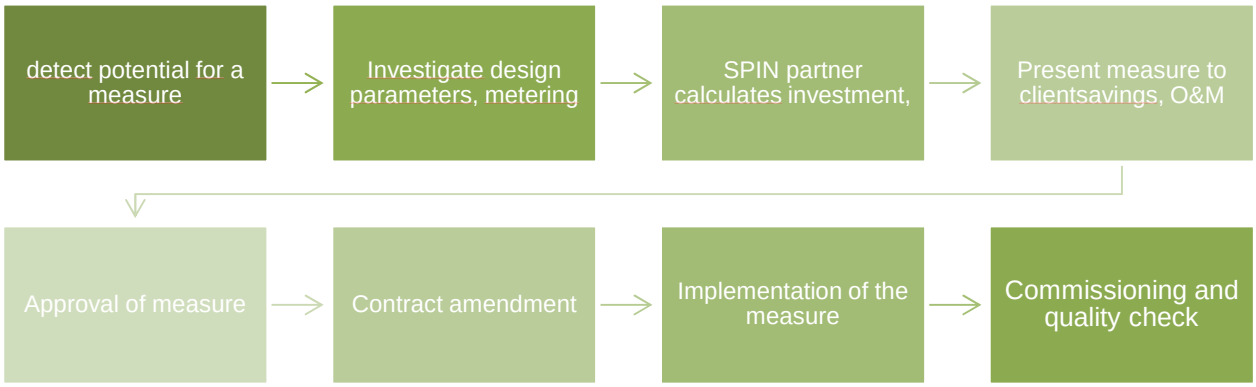
Each measure applicable for EPC+ is described on a general basis. Moreover the design parameters and the possibilities for application are defined, last but not least including a list of situations, where the specific measure is not applicable.

Calculation method

For the facilitation to introduce the measures for a SPIN the generic method of calculating effort for implementation, O&M and savings is described, ideally in form of a product-unspecific, open-source calculation tool.

Process flow

The generic process flow is identical for all measures. Therefore it is also part of the business model of EPC+, variations might be necessary for specific business cases, i.e. if measures interact with each other during their implementation or in their performance phase. See therefore also the interaction matrix of EPC measures, which serves as a quick indicator in which way measures might interact.



As a further development and because of the several players and interfaces in communication the process-flow-diagram is also visualized in the design of the ***service blueprint*** (see chapter 2.1.3)

1.1. Toolbox

Each measure is being described in general and in detail. The measures are categorized in energy-efficiency and renewable energy measures. All measure descriptions can be downloaded at http://epcplus.org/energy-service-packages/. Here is an overview of all measures that have been elaborated:

Energy-efficiency-measures:

1. Indoor lights: LED lights + control system
2. Hydraulic adjustment of heating system
3. Energy efficient pumps
4. Modernization of electrical motors
5. Night cooling
6. Optimising parameters of HVAC systems
7. Managing and metering systems for buildings
8. Renovation/replacement of heating boilers
9. Efficient windows
10. Industrial steam boiler blowdown heat recovery

Renewable energy measures:

1. Solar Thermal Domestic Heating Water
2. Biomass for heating and/or domestic hot water
3. Combined Heat and Power (CHP)
4. PV-panels
5. Wind-power
6. Heat pumps

2. Energy efficient pumps

2.1.1. Technical description

2.1.1.1. General description (PU)

During heating season heating pumps are running – quite often permanently – in order to circulate hot water between heat source and heat demand (e.g. radiators) for conditioning space. These pumps often run for the whole heating season, thereby consuming a considerable share of electricity. By using high-energy-efficient heating pumps up to 90% of the electricity demand on this appliance and varying shares of distribution losses can be reduced.

Moreover the right dimensioning of heating pumps increases energy efficiency: especially on old, restructured or renovated buildings heating pumps are often inefficient and over-dimensioned. Because of inadequate commissioning of heating pumps and heat distribution system also a decrease of comfort conditions can occur.

This measure reduces electricity as well as heat consumption and delivers even better results, if performed in a combination with hydraulic adjustment.

2.1.1.2. Design parameters

- Which parameters are necessary to survey for the design of the measure?
    - Technical parameters
        - Existing pump
            - Manufacturer
            - Pump type
            - Nominal pipe size
            - Port to port length
            - 1-phase / 3-phase
            - Speed control (constant speed (on which level) / integrated speed control)
            - Pump design (canned rotor/glandless pump/glanded pump)
        - Duty point definition
            - Flow [m³/h]
            - Head [m]
        - Operating times (seasonal: when in autumn are the pumps turned on, when in spring are they turned off, operating hours per day)

- Are temporary meterings necessary and which?
    - If the duty point definition is obviously wrong, suspicious or missing: difference of temperature and pressure between flow and return flow have to be metered over a period of 1-2 days.

2.1.1.3. Measure suitable for

Typical surrounding conditions for this measure:

- Existing heating pumps have fixed speed regulation
- Circulator pumps for hot water circuits
- Temperature differences between flow and return flow temperature is too small
- Age of pump >10 years

2.1.1.4. Measure not suitable for

Typical failure condition for this measure (but often seen)

- High efficient pumps for water tank feed pump
- Pumps with little operating hours and electric power

2.1.2. Calculation method

2.1.2.1. Expected savings

The savings between status quo and implemented measure can be calculated through this tool and includes cost reduction of electrical energy:

http://lcc-check.wilo-select.com/Pump.aspx

https://at.grundfos.com/grundfos-product-center.html [1]

Consider risk surcharges in relation to the preferred M&V (2.1.4)

Mandatory output parameters:

	Dimension	Amount, formula or reference
Cost savings	*[€/year]*	Use online-calculation-tools, e.g. above
Consumption savings	*[kWh/year]*	Use online-calculation-tools, e.g. above

In combination with hydraulic adjustment further savings in heating costs can be generated.

[1] The stated calculation tools are only to be seen as examples and have to be verified for each SPIN separately, if this measure is applied with support of those tools. The tool might only be used, if the calculation method is transparent and reproducible.

2.1.2.2. *Investment costs*

Costs to be investigated and agreed on within the SPIN:

1. Material: pump, additional equipment
2. Labour: base price (depending on distance to client, including traveling cost), price per pump
3. coordination, engineering: lump sum, to be determined by each SPIN
4. optional: metering of existing system: lump sum per circuit

Mandatory output parameters:

	Dimension	Amount, formula or reference
Costs material	*[€]*	Price compontents see above
Costs labor	*[€]*	Price compontents see above
Costs design, engineering, coordination	*[€]*	Price compontents see above

2.1.2.3. *Running costs*

One-time-quality check incl. fine-tuning after one heating season, should be in transition period between winter and summer.

Mandatory output parameters:

	Dimension	Amount, formula or reference
Running costs	*[€/year]*	no running costs

2.1.2.4. *Expected life-span of the measure and resulting replacement-costs (if any)*

The pumps are considered to work properly for 15 years

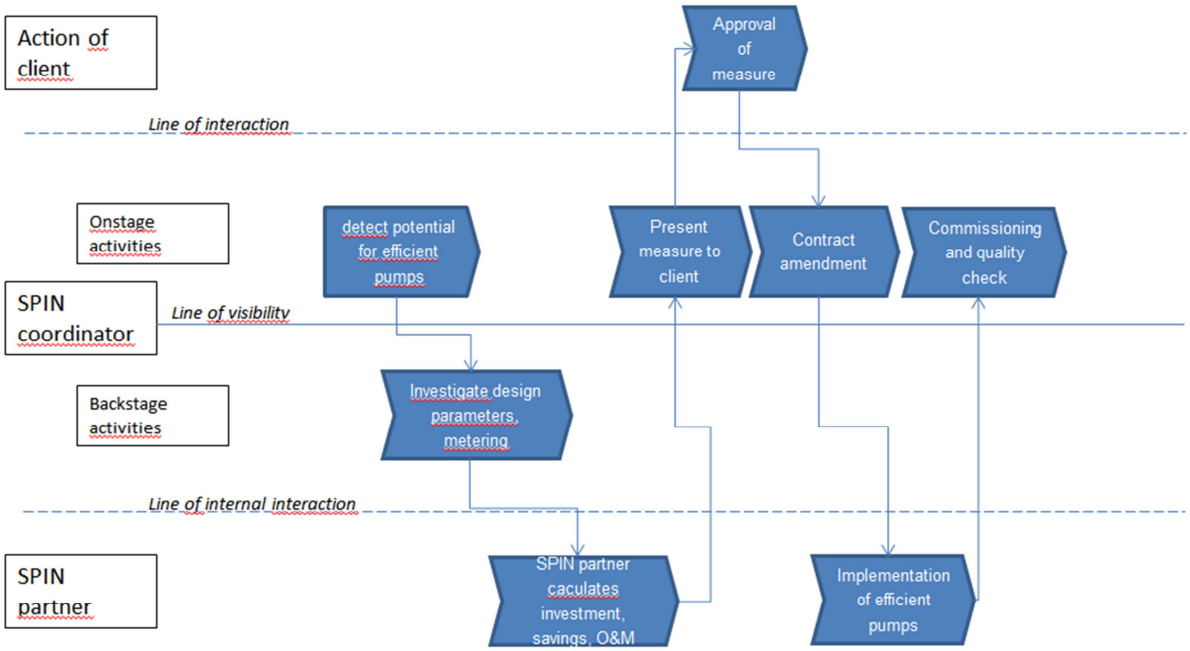
Resulting replacement-costs: irrelevant

Mandatory output parameters:

	Dimension	Amount, formula or reference
Life-span of measure as a whole and specific components	*[years]*	15
Yearly costs	*[€/year or % of investment]*	0

2.1.3. Process flow implementation: including quality assurance measures during and after implementation (PU)

Example



2.1.4. Options on measurement & verification in order to evaluate the performance in relation to the given performance guarantee[2]

Option A of IPMvP: key parameter measurement

Before and after the implementation the electricity consumption of each pump, that will be / has been changed, has to be metered over a period of at least 24 hours (alternatively other number of full days). The difference in consumption justifies the achieved savings.

Similar usage conditions of the respective facility of the two metering cycles should be evident and be documented.

Remark: the savings in heat demand are justifiable only with high effort. Therefore it is recommended to meter the savings on heat demand only, if in parallel a hydraulic adjustment has been carried out.

[2] Criteria: minimum effort, but still a proper qualitative proof for solid implementation and a considering performance, not installation only

Inacceptable options for a SPIN:

1. calculation of static payback
2. only one-time-metering right after installation