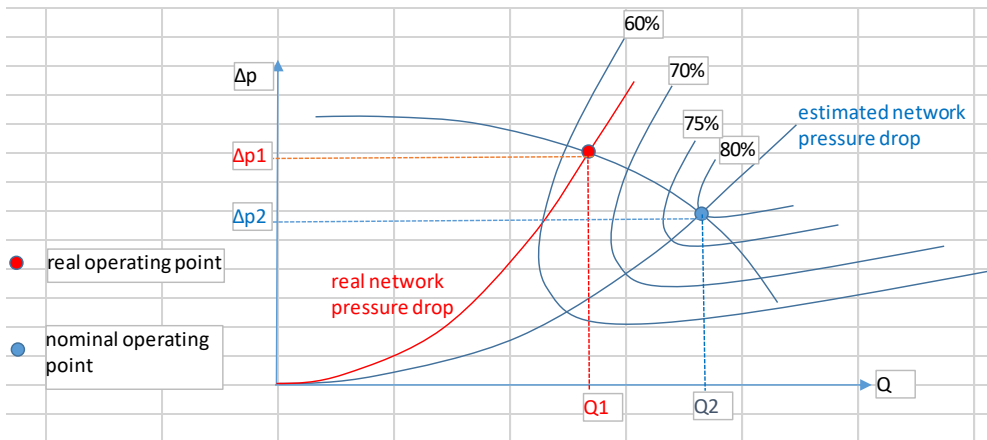
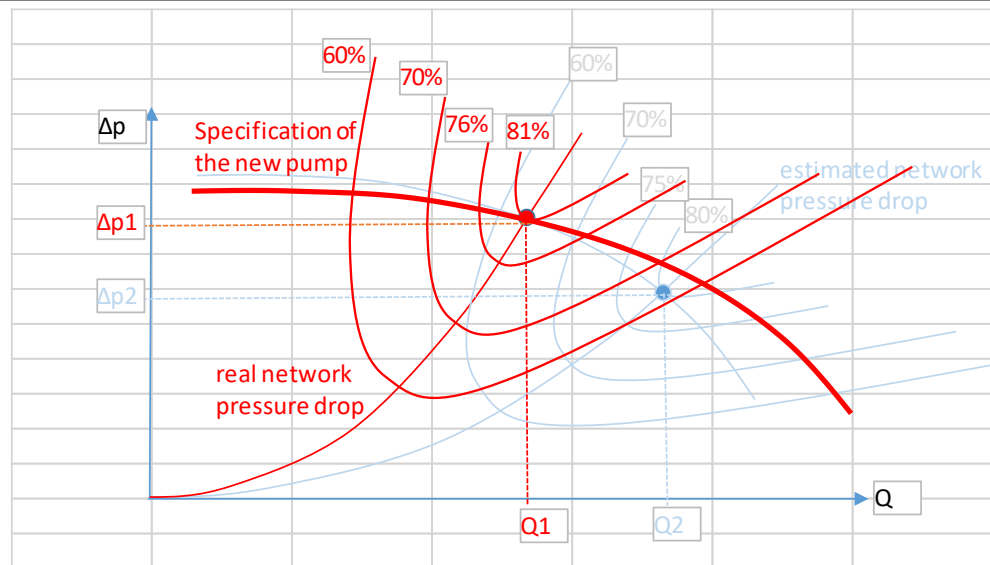




| Best Practice | PUMP REPLACEMENT | PUMP-06 |
|---------------------------------|--|---------|
| Application | Optimisation of Pumping Systems | |
| SME sector | Industrial | |
| SME Sub-sector | All | |
| Technical description | <p>In many pumping systems, the pumps are not working in an optimal operating point which leads to a low efficiency. The reasons for that are:</p> <ul style="list-style-type: none"> • very approximate estimate of network pressure drops • addition of safety margins (oversizing effect) • evolution of the user needs or network over time <p>The problem is that the efficiency of pumps is very sensitive to the operating point. Unlike motors, efficiency drops very quickly when moving away from the nominal point. Operating at mid flow can reduce the pump efficiency of 20 or 30%.</p> | |
| Recommendation for optimisation | <p>As can be seen from this example, efficiency in the real operating point is about 64% instead of 80% for the nominal point.</p>  <p>When the demand is constant (Q1 value), a new pump can be scaled for this flow rate. Depending on the actual pressure required, the new pump will be designed to operate with flow values of Q1 and Δp1 or Q1 and Δp2, not changing the actual operating point.</p> | |



Operating configuration of the new pump

In this case, the energy savings, 22 %, comes from a better pump efficiency. An additional gain would have been achieved if the needed pressure had been Δp_2 .

| | |
|----------------------------------|---|
| Economics | The average cost to replace a pump is 500-1,500 EUR, depending on the type of pump, power, manufacturer, and system. |
| Energy savings | Up to 30% |
| Economic savings | Savings in maintenance costs and due to possible energy savings (30%) |
| Average Payback Time | Less than 3 years |
| Emissions | This measure shall not entail further emissions. |
| Environmental benefits | Reduced CO ₂ emissions due to a reduction in electricity requirements. |
| Main NEBs (Multiple benefits) | <input checked="" type="checkbox"/> Environmental benefits <input type="checkbox"/> Increased productivity <input type="checkbox"/> Work environment/ Health/Safety <input type="checkbox"/> Increased competitiveness <input type="checkbox"/> Maintenance |
| Replicability | Medium |



| | |
|------------------|--|
| Related measures | <ul style="list-style-type: none"> • PUMP-01: Reduction of running time for pumps - Switch off motors when not needed • PUMP-02: Adapt the offer to real needs • PUMP-03: Optimised control of pumps • PUMP-04: Motor replacement • PUMP-06: Pump replacement |
| Case study | <p>Pump replacement, industrial dairy plant (Switzerland, 2018)</p> <ul style="list-style-type: none"> • Initial Situation: process cooling water in an industrial dairy plant. Due to a real network pressure drop much lower than calculated, the real operating point is located far to the right of the nominal point. To avoid a much too high flow rate, the pump speed is lowered. The efficiency is nevertheless very poor (30% global efficiency). • Description of the optimisation: a new pump with a correct design has been implemented as well as an IE4 motor. Due to constant need, the converter has been replaced by a soft start. The global efficiency reaches now 75%. • Implementation costs: 12,000 EUR • Payback Time: 2.9 years |
| References | <p>Swiss Federal Office of Energy (<i>SFOE</i>)</p> |

This Best Practice was developed by the Impawatt Project (GA No. 785041) and adapted for the GEAR@SME Project (GA No. 894356)