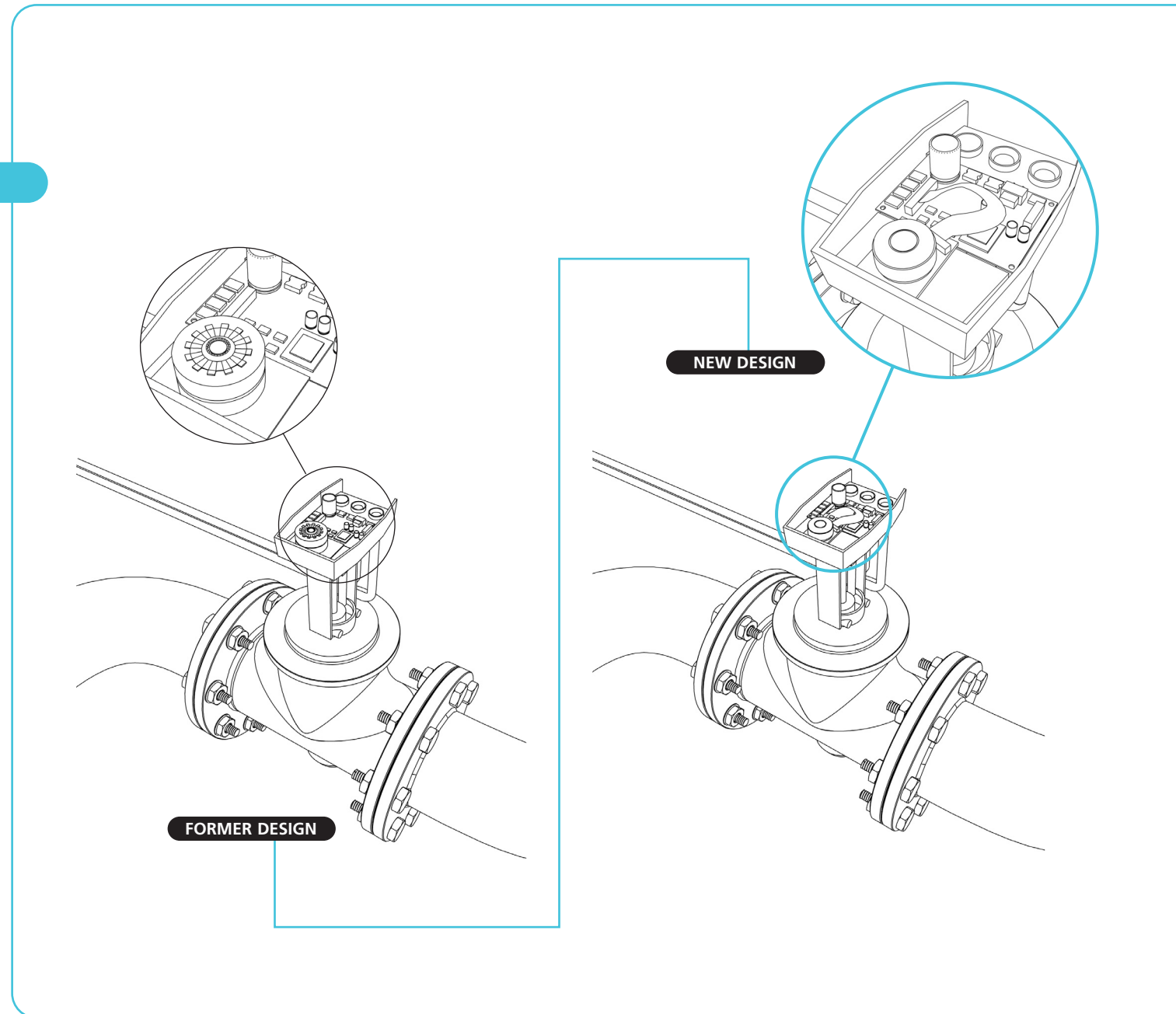


**Unjo control can be soundless**

Heating control was noisy and insufficient.

Now it's soundless and highly efficient.

One problem was noise. Another was that inadequate motor torque control caused small valves to break. We solved these problems by introducing a virtually soundless, low-cost, brushless DC-motor application. State-of-the-art control provided both high and variable actuator force along with several other advantages such as lower material and production costs.



# Development assignment: Valve actuator

## PRODUCT FUNCTION

The current valve actuator is used to regulate valves, primarily for handling water or steam in buildings. The actuator is linear, i.e. the valve shaft is pushed into and pulled out of the valve chamber. Traction is in the region of 250–1,000 N, stroke 10–50 mm and the speed is variable up to a maximum of 1 mm/s. This type of actuator is very common in regulating the temperature of the hot water circuit in district heating systems because it is considered relatively fast.

## TECHNICAL COMPARISON

### • Existing solution

Actuators of this type are generally powered by AC induction motors or step motors. Induction motors produce a constant speed, and the correct position is achieved by ordering the actuator in the right direction, i.e. until the valve is in the right position. Step motors can be positioned, but with low performance. Neither of these motor types can be controlled with variable torque and thereby variable actuator force – at least not without extremely complex adaptation.

### • New technical solution

The newly designed actuator is powered by a brushless DC motor. The motor type has been around for a while but has never previously been used for this type of actuator – one reason being that before now, motors have not been available in a price category compatible with low-cost applications. Moreover, there have not been the components or methods to produce the necessary electronics with sufficient cost efficiency.

The motor is adapted to be compatible with the actuators both in terms of mechanics and the technical drive solution, without modification.

Although it is considerably smaller than motors that have been used in previous solutions, it delivers significantly higher torque. Moreover, the torque is readily adjustable. The electronics, although slightly more complex than before, have been considerably miniaturised and built with more modern technology.

In order to further save costs, the testing procedure has been significantly streamlined, both when producing the printed circuit board and when mounting and testing the actuator.

## BENEFITS ON COMPLETION

These are the main customer benefits on completing the assignment, in order of importance:

- The virtually soundless motor has expanded the market for the actuator – for instance it can be mounted in a ceiling.
- The motor torque can be precisely controlled, eliminating the risk of breaking small valves due to excessive force.
- The controllable torque of the motor means only one version of PCBA has to be produced and stocked. The right torque, and thereby also the right actuator force, is set during final testing when the actuator is mounted.
- The greater power resources of the motor have expanded the market for the product. New actuator types with higher power than before (roughly equivalent to double) can be produced by a simple torque adjustment.

- The fact that the motor is considerably better controlled than before gave rise to direct synergetic improvements in function and performance. Ultimately, advanced control technology brought benefits over and above the original brief.

## PROJECT BACKGROUND AND DEVELOPMENT

At meetings with Unjo, the client presented two immediate problems:

1. The power could not be controlled sufficiently well.
2. The noise level was far too high.

Unjo's proposed solution entailed switching to a BLDC motor and completely redesigning the control electronics. The primary requirement from the client was that the product cost could not exceed the existing solution. Unjo had to take three measures to meet this cost requirement:

- We optimised the electronics design.
- We were deeply involved in the specification and procurement of the right motor.
- We adapted the client's production process and built a high-performance production testing system for the PCBAs.

During the ongoing collaboration, Unjo has contributed to the client's marketing strategy. We have added functionality and performance to the actuators by enhancing the actuator software. This has enabled the client to further expand their market.