Minor cause—major effect
Switching synthesis equipment from water to air cooling saves more than just precious water.

Daniel Zimmerli is responsible for laboratory equipment in research building number 92. A chemist with a predilection for innovative technologies, in his role he is often a contact person for representatives trying to sell new kinds of laboratory products. This was the case last year, for example, when the company Radleys presented a product known as the Findenser, which enables 95 percent of all laboratory synthesis processes to be switched from water to air cooling.

The potential of such a changeover is clear, at least to chemists. Every day, hundreds of chemical reactions are performed in the Roche laboratories, most of them in solvents and at high temperatures. To keep the amount of solvent lost through evaporation to a minimum, condensers fitted to the reaction vessels ensure that the liquid constantly condenses and drips back into the vessel. Conventional condensers are attached directly to a cold water tap, consuming about 2.5 liters of water per minute. That equates to 600 liters over four hours of operation and an impressive 3600 liters in 24 hours. At an average price of Swiss francs 2.40 per 1000 liter, the costs of the water used for synthesis in a reaction lasting 24 hours would come to Swiss francs 2860 per year. If laboratory air is used as a coolant instead of flowing water, the savings for multiple reactions running at the same time add up to considerable sums. At least that is what the manufacturers claim.

Daniel initially tested ten devices in a continuous operation together with an intern: “We were able to confirm all the manufacturer’s claims and are confident that this small, relatively inconspicuous laboratory device will bring about considerable improvements for Roche.” The new condenser does indeed look rather unassuming. A finned aluminum case surrounds an internal glass condenser, and between them there is a small, permanently sealed layer of water for cooling. Conventional condensers are attached directly to a cold water tap, consuming about 2.5 liters of water per minute. That equates to 600 liters over four hours of operation and an impressive 3600 liters in 24 hours. At an average price of Swiss francs 2.40 per 1000 liter, the costs of the water used for synthesis in a reaction lasting 24 hours would come to Swiss francs 2860 per year. If laboratory air is used as a coolant instead of flowing water, the savings for multiple reactions running at the same time add up to considerable sums. At least that is what the manufacturers claim.

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At a big company like Roche, the effect of saving fresh and waste water may seem relatively minor, but it also has an entirely different benefit according to Daniel: “Reactions run for many hours, often overnight. Once or twice a year, water supplies can become disconnected or spring a leak, and this can very quickly flood the laboratory. Thanks to air cooling, we have eliminated this risk.”

Two hundred air condensers are now in use in various research laboratories and even one or two production laboratories at Roche. The feedback is positive and there have been no complaints. If Daniel Zimmerli had his way, good old water or intensive condensers would soon be a thing of the past. “For me, this is a successful example of how supposedly small innovations can make a big difference.”