The planned expansion of semiconductor production would generate a proportionately higher demand for ultrapure water. The company’s management assumed that possible bottlenecks in the existing system could be detected and removed, resulting in higher UPW production. The engineers, in turn, suspected that the existing capacity to produce ultrapure water would not be sufficient to meet the growing demands within an expanded production environment.

### The Mission: To Analyze Capacities

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### Risks Inherent in a Shortfall of Production

- The quality of the ultrapure water cannot be ensured
- Uninterrupted production cannot be guaranteed
- Dependent assembly processes could be affected as well

For a comprehensive analysis, current conditions must be determined and the expandability of the existing systems calculated.
**RESULT:**
The ultrapure water system would have to be expanded. An important tool to get the job done quickly? Umberto.

Arcade Engineering won the contract to plan and construct the additional UPW manufacturing system. It took Arcade only 16 months from securing the contract to the system’s final inspection.

**CUSTOMER TESTIMONIAL**
“By modeling the expansion with Umberto, we were able to obtain a corresponding energy balance for each new mass balance we created, after integrating enthalpy flows. This surpasses the capacities of the competition by far.”

Dr. Martin Schottler, modeling specialist for Arcade Engineering GmbH

**BACKGROUND**
The preexisting installation (subsection) has a capacity to produce and use more than 250 m³ of ultrapure water per hour. The entire installation consists of the four sub-processes PSa, PSb, PSc, and polishing. Each step in the process – through its multiple applications of individual operational elements and supply units – is designed so that individual steps in the process can be removed from the system in order to allow rinse and regeneration phases to proceed without decreasing overall production flow. During these “service flow” phases, the water in the removed subsections is thoroughly cleaned and all residues removed, while the remaining operational components and supply units handle a temporarily increased flow volume. This continuous cycle of production, as well as cleaning and regeneration, guarantees a continuous supply of UPW for semiconductor production.

**MAJOR RESULTS FROM THE APPLICATION OF UMBERTO**
- Umberto was able to calculate and present three detailed ultrapure water systems, each with the same basic structure, but utilizing different connections.
- A more highly transparent analysis was achieved, which also benefited the client.
- The planning process was quicker: for example, only four hours after the start of the modeling process, a water balance was available that proved to be 90% correct and only needed some further refinement.
- Energy balances were always calculated simultaneously and consistently with mass balances.
- High transparency was also achieved in another important sector: reserves management
- Consistent balance documentation was made available.
- The model is expandable and can be reused.
- An intense transfer of knowledge could be achieved by handing the model directly to the client’s employees.