



SUCCESSFUL USE OF UMBERTO FOR THE PLANNING OF SEMICONDUCTOR FAB S

THE TASK

M+W Zander had the objective to develop a scalable and customizable model for calculating costs of semiconductor fabs in the design, construction, and operations stages. The model was intended to predict investment costs as well as operational and maintenance costs. A typical production site has more than 150 to 300 different process tools, and some 50 supply and waste disposal systems. In order to better handle this complexity, the decision makers at M+W Zander chose to use Umberto.

THE CUSTOMER

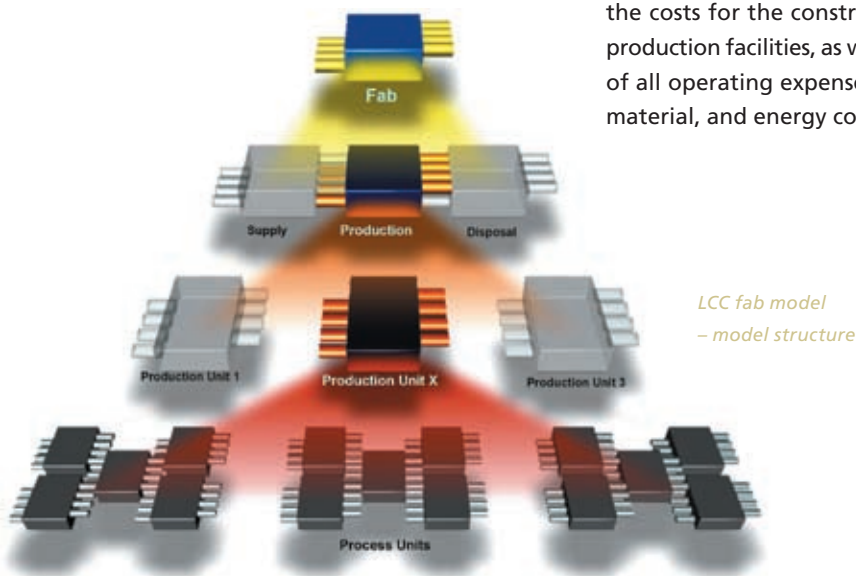


STRATEGY AND IMPLEMENTATION

The Fab Life-Cycle Cost Model ('LCC Fab') is a comprehensive consulting instrument for process optimization in the semiconductor industry. The main substrate for the production of semiconductor chips is the wafer. By creating structures within and on top of the wafer, circuits are created. Both additive and subtractive technologies are used in processing. The building materials for the circuits are various conductors and insulators, which are applied using thin film

technology. The wafers are typically passing through key process steps 12 to 20 times, sometimes in more than 30 cycles, resulting in several hundred processing steps in total. The whole processing of the wafer in a semiconductor fab requires approximately 40 to 50 days. M+W Zander has developed an LCC model for the highly complex equipment sets that includes all relevant parameters for the operation of a semiconductor fab. The model is unique and as yet unrivaled. It includes all investment costs, the costs for the construction of building and production facilities, as well as detailed accounts of all operating expenses (labor, maintenance, material, and energy costs).

M+W Zander Group delivers complete services and solutions for factory buildings, office complexes, and high-tech production facilities. One of the core competencies of the company is to offer all stages of semiconductor fab building, from consultation, planning and construction to operation of the facilities.



MAIN UMBERTO FEATURES USED

- Individual process modules in a library
- Cost accounting
- Scripting for automated model creation
- Scenario analysis
- Umberto Viewer for transfer of models to customer
- Sankey diagrams
- Flexible interfaces

CUSTOMER TESTIMONIAL

“The modularity of the model and the flexible handling of the process ‘building blocks’ in the libraries of Umberto allowed us to create and administer very meaningful yet complex models. Often, the graphical representation of the calculated mass and cost flows leads to a breakthrough in communication with our customers, as we can create a degree of transparency we would never be able to achieve with table-based presentations.”

Dr. Martin Schottler,
M+W Zander, Stuttgart,
Germany, 2006



The following data is included in the LCC fab model:

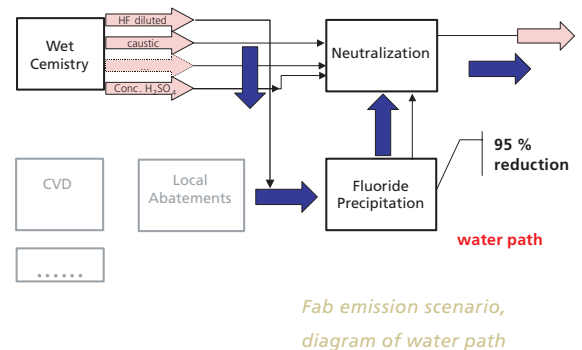
- Process data
- Equipment consumption data (using average values or recipes)
- Supply and waste disposal systems including specific consumption data
- Cost information, e.g. market prices, depreciation

Results of the simulations were, for example:

- Cost calculations (per site, product or equipment)
- Estimation of environmental impacts
- Mass and energy flow data
- Scenario analyses

Depending on the focus of each individual consulting project, different data on different levels of detail is required for modeling. The customer collects the data using an Excel document. The spreadsheet serves to automatically adapt the generic LCC model to the specific situation, cre-

ating a specific model in Umberto. It is based on the material and energy input and output flows of the production site, but allows for the separate analysis of individual flows in any production sector. Thus, one main advantage is the ability to calculate and visualize in detail the material, energy, and cost flows at any chosen point in the production sequence. Furthermore, the model supports analysis and comparison of emission scenarios with regard to the concentration of chemicals in waste water and the amount of gaseous emissions to the environment.



EXAMPLES OF UMBERTO APPLICATION

Calculation of cost flows

Each cost flow in the Umberto model is linked to a material or energy flow. Based on the production of one wafer (cost unit), all costs can be analyzed in detail, for example: supply materials, waste treatment, overhead for equipment, maintenance, or labor costs.

Environmental modeling

The LCC model incorporates all emissions, concentrations of chemicals in waste water, and compositions of effluent gases. It can be used to compute detailed data that are required for public authority approval procedures.

MEASURABLE RESULTS AND BENEFITS

The LCC model allows for the detailed planning of new semiconductor fabs. Sites already in the production phase are supported by permanent material and energy flow management.

The model allows calculation of all relevant costs of production:

The model is a working image of the production processes:

- A modular, networked, parameterisable system
- Mass and energy flows for cost calculation
- Environmental performance indicators

- Categorization of costs according to international standards
- A consistent cost structure for all process modules
- Helpful visualization of cost flows
- No hidden cost blocks

umberto® is developed in cooperation with ifeu (Institute for Energy and Environmental Research Heidelberg). Photos with kind permission of M+W Zander Group.