



Large vessels, tanks, reactors and a high number of pipelines are characteristic for chemical plants. In general the pipes are essential components of large-scale technical plants, even in refineries or power stations, since they are required for interconnection of components, for supply and discharge of fluids.

It is not surprising that IT tools for pipeline planning and calculations had been developed early already and are urgently requested by planning engineers. The pipeline calculation program

Rohr2 (supplier: Sigma Ingenieurgesellschaft) has been used by national and international plant construction contractors and equipment operators from the energy sector, chemical and pharmaceutical industry for static and dynamic analysis of complex pipeline systems for more than 40 years already. Even technical inspection authorities use it for examination of pipe system structure analyses.

The manager of Sigma Mr. Stefan Masala states: "Rohr2 is a complete interactive application and intuitively understandable in many fields." First of all, the user shall decide which standard calculation code shall be used "The user has a great variety of national and international codes and standards available for selection, such as ASME, ANSI, EN 13480, KTA or ISO 14692 that are continuously updated in the framework of software maintenance", says Mr. Masala. The user receives assistance for modelling and testing of its inputs through plausibility checks. Verification of stresses and determination of loads are performed automatically in conformity with the selected code.

Mr. Masala: "In principle, Rohr2 is used in all applications where pipelines are operated under pressure and temperature conditions. Apart from statutory provisions for calculation, even the desire to develop cost-saving conceptions plays a decisive role." More than 500 customers with more than 1000 licences demonstrate the broad acceptance on the market.

Stress calculation in sensitive pipeline systems

One of these applicants is AMR-Engineering. The company has been a project engineering and plant construction contractor and supplier of machines and equipment for chemical and pharmaceutical industry, power engineering and metallurgical industry for more than 40 years already. Some 40% of AMR's turnover are derived from supply of tanks, steel and pipeline construction. Therefore it is not surprising that this engineering undertaking has been working with the calculation program Rohr2 for more than 20 years already.

Dipl.-Ing. Jürgen Pagel, technical manager of AMR-Engineering, reports: "Stress calculation is obligatory in case of sensitive pipeline systems in plant engineering, especially in nuclear power stations – and the customer requests this in most different forms, or it is dictated in the applicable codes and standards. We must verify that stresses in pipelines cannot exceed the defined limits. Sometimes it is even necessary to simulate situations, such as different operating regimes or even extreme load case situations and severe accidents."

The pipe support system used for pipeline installation must be applied so that excessive stresses can occur neither in the course of conventional operation nor in case of rare situations like water hammers. When planning nuclear power stations, even improbable occurrences like aircraft crashes, earthquakes or shock waves resulting from an explosion must be simulated as load case. Mr. Pagel says: "We can examine all these dynamic load cases with Rohr2."

The features of ROHR2 at a glance:

- Pre-processing and post-processing via interactive user interface to be operated intuitively;
- Comprehensive component data bases;
- Automatic determination of loads like wind, snow etc.;
- Automatic generation of stress analyses;
- Automatic determination of maximum bearing and joint loading;
- Static analysis according to theory of 1st and 2nd order;
- Dynamic analysis according to modal response method and direct integration;
- Intrinsic values, earthquakes, pressure surges, any time-dependent load situations;
- Load sequences, load case hysteresis;
- Non-linear properties like bearing clearance, bearing friction etc.;
- Flexibility of tank nozzles;
- Pipelines made from plastic materials;
- Buried pipes and lines;
- Hydraulic shock absorbers, dampers, Visco dampers;
- Automatic report generation;
- Graphic and tabulated documentation of inputs and results;
- Filter functions for selection of results;
- Documentation of sub-domains;
- Data export for texts and graphics.