Hydraulic design and simulation **capabilities from HYDAC**

HYDAC Technology ZA's engineering team presents its custom design approach for developing, optimising and installing modern hydraulic systems and associated pressure equipment.

HYDAC Technology's engineering team: from left: Christof Smith, Engineering Projects; Ashwin Buntting, Engineering Design; and Tinus Vermeulen, System Sales.

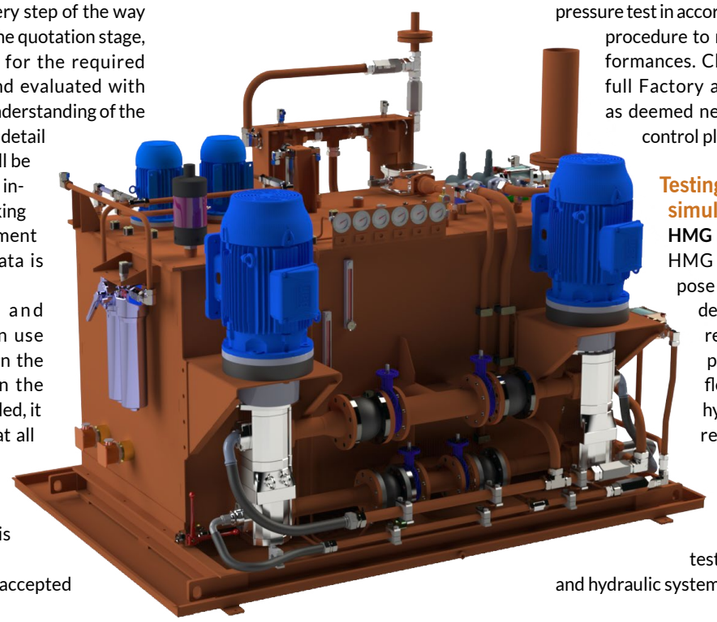
HYDAC Technology ZA has an extraordinarily strong design team in South Africa, along with additional access to a global support structure from its parent in Germany, HYDAC Technology GMBH. The company's engineering teams design hydraulic systems for use in any country in the world using the relevant design specifications and safety regulations that apply in each country. This is vital for hydraulic pressure equipment to comply with local regulations and for electrical components to be suitable for the working environment.

HYDAC ZA approaches system designs as a joint venture with clients, believing that involving end users at every step of the way is critical for success. At the quotation stage, the needs and function for the required system are discussed and evaluated with clients to create a clear understanding of the objectives. Should further detail be required, a site visit will be done to gather additional information about the working environment and equipment to ensure all relevant data is obtained.

HYDAC's Design and Engineering teams then use the information to design the proposed system. When the base level design is compiled, it is reviewed to ensure that all the requirements are met. Once all the tick-box checks have been validated, the proposal is presented to clients.

As projects based on accepted proposals unfold, detailed design starts: with the generation of the hydraulic circuit; the Bill of Materials (BoM); and the development of 3D design models of the system. HYDAC and its clients review the design to ensure that the system's performance criteria and specifications – including hydraulic, mechanical, electric, control and all other interfaces – are all met.

HYDAC's in-house electric and control expertise includes design, testing and commissioning of any system from a simple terminal panel to a complex PLC system, with full integration of the hydraulic system and the control system.



HYDAC condition monitoring sensors and control systems are also incorporated to provide a complete and reliable turnkey solution. A deep and vast pool of hydraulic, mechanical and electrical expertise, locally and internationally, gives HYDAC an in-depth understanding of systems and ensures the necessary performance criteria are obtained. This results in complete, turnkey solutions that, when supplied, integrate seamlessly into a client's operations.

The project Engineering team brings the systems to life. After final design reviews and quality checks, the assembly of the hydraulic or lubrication unit takes form. On completion, the unit goes for a full functional and pressure test in accordance with a prescribed procedure to meet the specified performances. Clients are invited for a full Factory acceptance Test (FAT), as deemed necessary by the quality control plan.

Testing and design simulation capabilities

HMG Data loggers: HYDAC HMG instruments are purpose designed data logging devices for measuring and recording values such as pressure, temperature, flow rate and position of hydraulic systems. All test results are recorded on a HYDAC HMG 4000 data logger, with graphical data being made available with test reports of power packs and hydraulic systems.

The HMG 4000 is subsequently used to measure and record the performances on site when commissioning the system, with the results being compared to the values recorded during the workshop test. As an added value service for field testing customers' installed systems, HYDAC branches across South Africa are equipped with portable HMG kits, which are ideal for field or workshop testing of hydraulic systems.

ASP5/ASP Lite simulation software: Validating the design and component selection with simulation and component sizing software provides peace of mind that the design process will meet the real needs of the project. Simulation software such as HYDAC ASP5 for sizing of accumulators, takes into consideration real life behaviour of pressure vessels, analysing the simultaneous influences of pressures, temperatures, ambient and operating flow rates and volumes over a defined period.

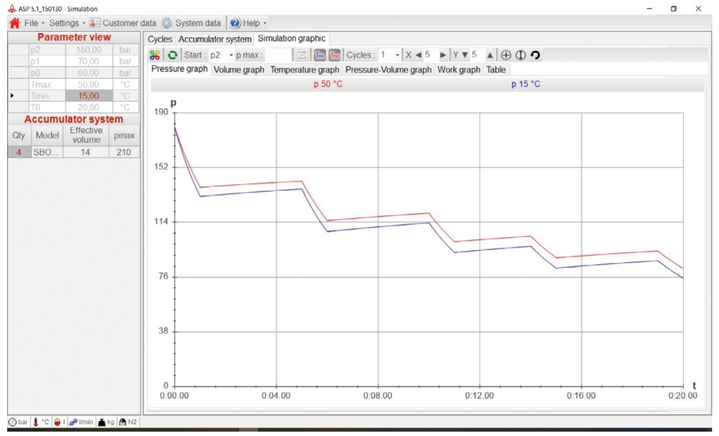
In addition, the calculation program, ASP Light, is an application based on adiabatic and isothermal laws of thermodynamics, allowing an approximate accumulator size to be established based on known input data.

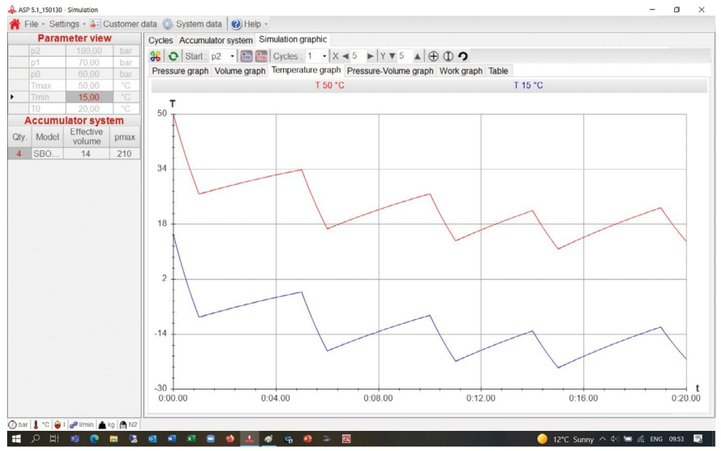
HYDAC FILTER IT²: Filtration in hydraulic and lubrication systems plays a critical role in equipment reliability by mitigating against components' wear and tear and maintaining fluid condition. HYDAC's Filter-IT² software assists in the final selection and validation of the products used by providing the necessary information of the chosen filter, such dirt holding capacity, actual ß-ratio and the pressure drop across the operating temperatures from start up to full operation. The resulting data represents the filter's actual performance at a given flow rate, operating temperature, type of fluid, density and viscosity, and is available as a pdf document for technical support.

The high viscosity oils used in lubrication systems can result in oversizing the filter. An example of a set data for selecting a filter with the aid of Filter-IT² includes: Flow rate: 100 ℓ/min; Filtration: 20 µm (abs); Viscosity: 460 cSt; Clean element filter pressure drop: < 0.5 bar at 40 °C; Lowest temperature: 15 °C; Maximum operating temperature: 40 °C; Bypass at 6.0 bar; Clogging indicator at 5.0 bar

Cool IT and HYDAC HEX Light: When heat-load equilibrium is not achieved by the exposed hot surfaces at actual air temperatures and circulation, additional cooling is required to keep the equipment running within acceptable temperature levels. Additional heat must be removed by means of a heat exchanger or cooler. HYDAC Oil-to-Air coolers are known as Air-Blast coolers and HYDAC Plate Coolers are used for oil-to-water heat exchange.

These different types of heat exchangers are supported by the selection software programs, COOL-IT and HYDAC HEX Light respectively, allowing designers to select the appropriate cooler from the options made available by the relevant application.





HYDAC ASP5 simulation results for pressure (left) and temperature (right). Accumulators: Total gas mass, 0.99 kg: Total gas volume 14 ℓ.

A power chart from the HYDAC COOL IT application being used to size a HYDAC Oil-to-Air cooler. The suitable operating point for cooling this system is shown at 100 kW of cooling at 275 ℓ/min of flow.

"We at HYDAC offer the full suite of high-performance fluid engineering solutions, from commissioning to process optimisation, as well as our experienced engineering support using state-of-the-art simulation and engineering methods that are available to South African and international clients," says HYDAC Technology ZA. ❑