



Plant design, Optimization & Research in Process Engineering
HEAT TRANSFER and PROCESS DESIGN, Heisenbergstraße 17 - 33104 Paderborn, Telefon: +49-(0) 5254-640 2514, Telefax: +49-(0) 5254-640 2513
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Reference:

PLANT CONSTRUCTION



Development, engineering, simulation and design of IR belt dryers for the drying of the precursors (cathode, anode and separator) in the production of lithium-ion batteries (Manz AG)

- Conceptual design and calculation of refrigeration cycle for air-conditioning and cooling
- Calculation and design of continuous dryers with IR heaters and convection for the production line
- Design of IR-emitters
- Calculation and design of the air volume for the air-conditioning of dryers
- CFD flow simulation
- 3D design
- Calculation of mass, energy balances and kinetics

Studies and selection of an optimal method for the drying of the cathode, anode and separator in the manufacture of lithium-ion batteries for electric cars (Li-Tec Battery GmbH)

- Study on the selection of appropriate online measuring method in the ppm range for the determination of water content in film-wrapped Goods



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- Implementation and evaluation of dehydration tests under the IR emitters
- Concept development and design of refrigeration cycle for air conditioning and refrigeration
- Calculation and design of the dehumidifier cycle (adsorber) for air-conditioning dehydration room, dew temperature = -60°C
- Preparation of specifications for various process steps of cell production
- Identifying strategies to prevent the re-wetting of various hygroscopic products.

Construction of air conditioning plant for the largest drying room in Europe (ISO7, clean room classes according to ISO 14644-1) (Li-Tec Battery GmbH)

- Design of test plans, implementation and evaluation of the results
- Supervising talks with the plant suppliers and OEMs (**Daimler AG and Deutsche Accumotive GmbH & Co. KG**)
- Control and verification of the RI flow-charts and the overall processes
- Control and verification of energy and mass balances, selection of the plant components
- Implementation of FMEA and FMECA
- Technical solution for critical processes during the realization and construction of the entire plant
- Conduct claims management

Development of a physical model to describe the cooling operations in the ACC facility (SMS Demag AG)

- Evaluation of measurement data from the ACC system (Fa. ThyssenKrupp AG) and analysis of cooling processes at various heavy plates.
- Optimization proposals for improving the quality of the heavy plate production of ACC-conditioning (Illsenburger Grobblech GmbH).
- Calculation of the two-phase heat transfer during evaporation.
- Calculation of local and temporal heat transfer coefficients of free, forced convection and radiation of heavy plates during the cooling process.
- Numerical calculation of unsteady heat conduction problem.

Construction and commissioning of a condensation-scale plant (AiF project No. 13736N)

- Overall planning of the condensing unit: Design of the investment cycle, Piping and Instrumentation Diagram (P&ID), construction of evaporators and condensers, planning of the pipeline system (CAD)
- Calculation of the thermodynamic properties: density, thermal conductivity, heat capacity, viscosity, etc. of various test substances (alcohols, Heat transfer oil).
- Preparation of technical tender documents, evaluation of tenders, coordination of overall planners (production and assembly) during plant construction
- Design of the plant components: pipes, pumps, tube heat exchangers, plate heat exchangers, evaporators and condensers



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- Development of facility security system for experiments with combustible mixture (explosion protection)
- Heat transfer and pressure drop measurements of pure vapors without condensation, single and multiphase vapor with condensation

Development of a model for the description of condensation processes on corrugated 3-D wall surface with the Navier-Stokes equation (University of Paderborn)

- Characterization of the isothermal falling film flow upon 3-D undulated surface
- Calculation of single-phase pressure loss coefficient in 3-D corrugated channels
- Calculation of pressure loss coefficient and the heat transfer from the condensation of steam in 3D corrugated thermal plate channel (Turbulent model)

Experimental studies on growth and product formation in red algae under constant and fluctuating light conditions in turbidostat (Institute of Mechanical biochemical engineering, University of Karlsruhe)

- Determination of biomass, pigment, polysaccharides production at different light intensity

Concept advice for an alternative gas-liquid mixing plant for filling Gas Insulated Switchgear (GIS) (Ferchau Engineering GmbH & ABB Ltd)

- Process and component Analysis
- Cost savings opportunity analysis

Dimensioning and calculations of petrochemical plant components (Linde Engineering AG)

- P&ID flow chart, basic engineering
- Interpretation of security, control valves (API, ISO)
- Calculations of mass flows and energy balances
- Mixture equations, two-phase calculations
- Piping
- Heat transfer calculations
- Security concepts and explosion protection, fire and gas

Technical advice on Plant Engineering (Lauda Dr. R. Wobser GmbH & Co. KG)

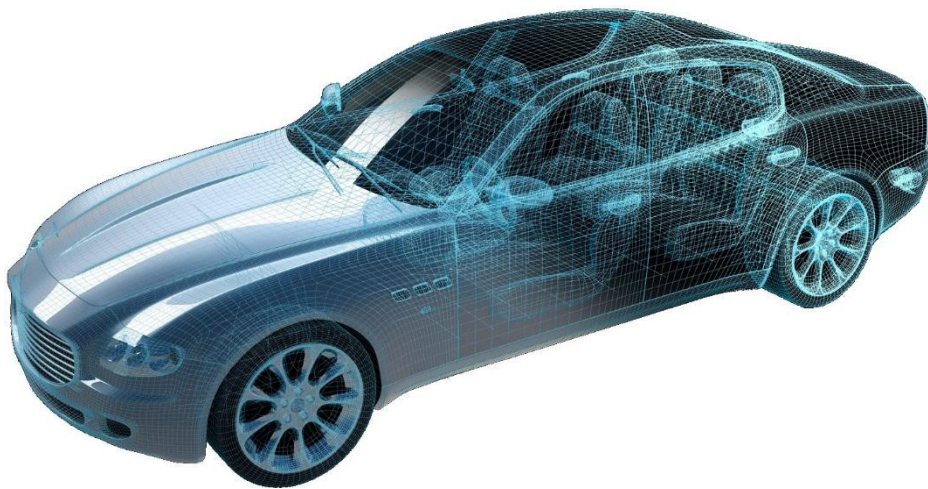
- Development of new innovative heating and refrigeration plant
- National and International guidelines and regulations in the manufacture and marketing of heating and cooling systems
- European pressure equipment guideline 97 /23 / EC
- Refrigeration circuit components suppliers research and selection



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- Design of refrigeration system with natural refrigerants
- European refrigeration and air conditioning equipment regulation EN 378 1-4
- F - gas regulation (EU) no. 517/2014
- Eco design guideline 2009/125 / EC
- ATEX-directive

AUTOMOBILE



Technology consultant, product and process development for battery cooling systems of the electric cars with the goal launch into the series productions (Mahle Behr GmbH)

- Investigations and evaluations of different manufacturing technologies
- Conceptual design, design and simulation of battery cooling systems
- Development of production processes for the battery cooling systems
- Creation of specifications for production plants
- Creation and evaluation of plans for supplier selection
- Supplier qualification and management
- Procurement of equipment for heat exchangers
- Commissioning of facilities for heat exchangers
- Preparation of a detailed technical documentation

Consultation for innovative heating and cooling system for LION battery of electric and hybrid cars (Genterm Inc.)

- Design review
- Product development and manufacturing for battery cooling systems for hybrid cars
- Calculation of the total cost and performance of the products



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R & D for battery cooling systems (Valeo Climate Systems GmbH)

- Concept development and validation of the battery cooling systems for hybrid vehicles
- Analysis, assessment and testing of the customer's specifications
- Implementation of the specification reviews
- Cost assessment of design and product validation
- Structure of the standard construction
- Supervision of the heating heat exchanger simulations
- Trial management and monitoring
- Prototype construction
- D-FMEA and P-FMEA
- Creation of test concepts to hedge the series products

Development of an air conditioning system for refrigerated trucks (Schmitz Cargobull AG)

- Concept assessment and validation
- Consultations on the selection of measurement techniques and sensors
- Flow simulation with Computational Fluid Dynamics (CFD) and StarCCM +
- Experimental design, concept, execution and evaluation
- Feasibility study of serial production

Electronic headlight with Xenon, -ALWR, LED u AFS control devices (Automotive Lighting GmbH)

- Supply and processing concept (requirements analysis, feasibility studies)
- Updating, coordination and tracking of electronic Applications time scheduling (TP)
- Update and Maintenance of project requirements in DOORS, the OPL and a project status chart
- Coordination of hardware and software reviews (Design Verification Documents, discussion with the customer)
- Internal and external coordination with regard to provision of electronic patterns
- Harmonization of the validation plan and discussion of the (intermediate) results (both internally and externally with suppliers and customers)
- Alongside coordination of series production and logistics in the run-up phase
- Alongside coordination of contributions to enable the control unit by the quality assurance
- Requirements analysis in the bidding phase and preparation of test comparisons

Development of a new method for measuring the degree of separation of filters (Mann + Hummel GmbH)

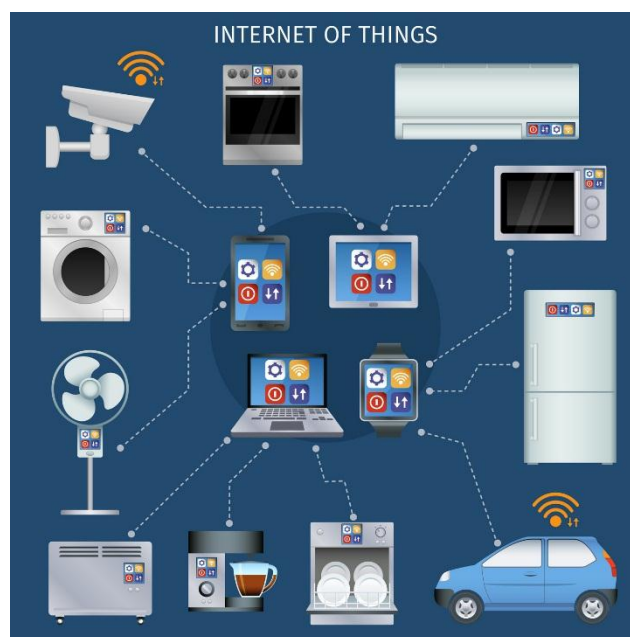


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- Automation of a measurement method for characterizing auto filters using optical particle measuring instruments
- Determination of particle concentrations (air-dust) in pipe for a 2-phase flow

BUILDING TECHNOLOGY



Planning and construction of an energy-saving house (Smart Home) with LCN (Local Control Network)

- Project Management: Project cost estimates, coordination of personnel appointments and suppliers
- Selection of suitable composite insulation system
- Design, development and construction of the heating and air conditioning system
- Creation of structural, thermal, and climate-technical documents
- Tendering and order of building materials and system components
- Planning and implementation of building system technology with LCN

Interim management and certification of electrical heating systems (Bartec GmbH)

- Management of product development of self-limiting heating systems for ordinary and Hazardous applications
- Management and consulting of the product certification process CSA, IECX, UL, ATEX
- Market and competitors analysis for North American (USA, Canada)



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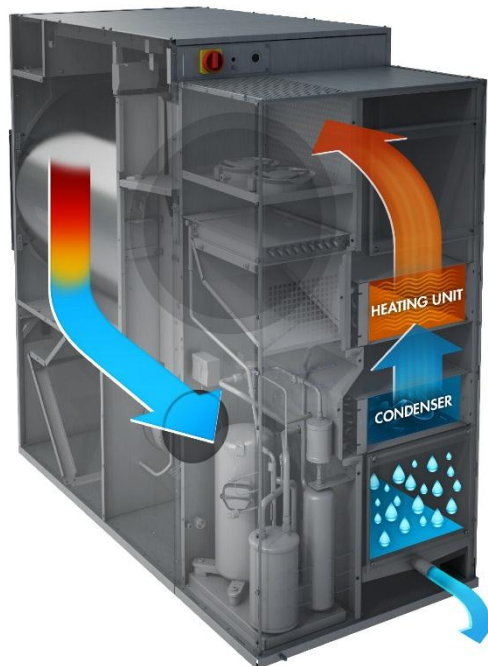
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- Conducting negotiations with the certification institutions
- Product and manufacturing cost analysis (value analysis)
- Planning and management of prototypes
- Planning and management of experiments and tests
- Analysis of customer specifications and standards
- Implementation of lean production and manufacturing

Product development and construction for heating systems in hazardous areas (Bartec GmbH)

- Concept development of products in explosion protection
- 3D-CAD design and construction
- Compilation of BOM, technical and sales documentations
- Preparation of manuals and documentation for approvals
- management and strategy design of the product certification process CSA, IECX, UL, ATEX
- Product and manufacturing cost analysis (value analysis)
- Planning and management of prototypes

GENERAL APPLIANCES





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Test bench for the pre and final assembly of heat pumps, electric boilers and gas condensing boilers (Vaillant GmbH)

- Definition of the test bench concept based on specifications from R&D, PFMEA, safety and standards
- Independent execution of feasibility analyzes
- Elaboration and specification of the criteria related to selecting external suppliers
- Coordinate the test concept with the partners involved: R & D, quality, work safety, industrial engineering
- Project planning
- Support and control of the supplier of the test bench hardware
- Pre-testing of the test bench at the manufacturer
- Support for commissioning the test bench
- Calibration, parameterization, function test, instrumentation analysis, documentation
- Support of final acceptance

Construction and testing of the Joule-Thomson refrigerator (Institute of Technical Thermodynamics and Refrigeration, University of Karlsruhe)

- Selection of 4-component refrigerant mixtures and optimization of their compositions for the highest efficiency of the system at cooling temperature (T_{min}) of $-210\text{ }^{\circ}\text{C}$
- Design of the system components: tube heat exchangers, evaporators and condensers
- Measurement of cooling capacity at different evaporating temperatures

Concept study of design and manufacturing technology of high efficiency heat exchangers for domestic and instrumentation technology (Miele & Cie KG.)

- Concept evaluation of heat pump dryers from Miele
- Process analysis of the heat pump dryer
- Performance analysis of various air-refrigerant evaporators and condensers
- Installation space and modular installation capabilities analysis of heat exchangers
- Intensification technology to increase heat transfer coefficient
- Various soldering methods for the production of heat exchangers
- Feasibility studies and production technologies of various heat exchangers

Construction of gas analyzers (ABB Automation GmbH)

- Supply and processing concept (requirements analysis, feasibility studies)
- Leadership (professional & disciplinary)
- Planning of resources & project contributions
- Elaboration of design concepts according to customer requirements



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- Planning of design tasks
- Implementation & monitoring of construction objects
- Monitoring of product development from the idea to the discontinuation of series products
- Responsibility for change management and maintenance of kit documents

Technical advice on product development of environment friendly refrigerator (Rittal GmbH & Co. KG)

- New product development strategy for refrigerator and refrigerant
- Optimization of chiller and air - conditioning systems
- Product and manufacturing cost analysis (value analysis)
- Modular systems for standard equipment
- Component development
- Ecodesign guideline 2009/125 / EC
- Increased efficiency of the new development strategy
- Strategy for manufacturing cost reduction
- Marketing and sales strategy
- F - gas regulation (EU) no. 517/2014