

## FOOD + PHARMA

SCHRADER unites process-based solutions, system components and process control to create turn-key, highly automated production plants.

# SCHRADER – intelligently crafted, implemented as turn-key systems

Applying synergy effects – from the concept phase through to the turn-key plant

Our experienced project managers and their task forces combine process-based solutions, system components and process control systems to create turn-key highly automated production plants. The process starts with discussions to define your exact requirements.

Our project services include planning, implementing, assembling, commissioning and, if required, maintenance and process optimisation.



## ACHIEVING TARGETS – THROUGH STRATEGY

SCHRADER was founded in 1969 near the town of Münster, north-west Germany. Today, the company covers the fields of process engineering, fluid technology and apparatus construction. Interdisciplinary cooperation among more than 200 employees facilitates an invaluable knowledge transfer between us and our customers worldwide, which boosts our capabilities from one project to the next.

## What we mean by turn-key

CONCEPT	Process development and identification Preengineering Create enquiry documents
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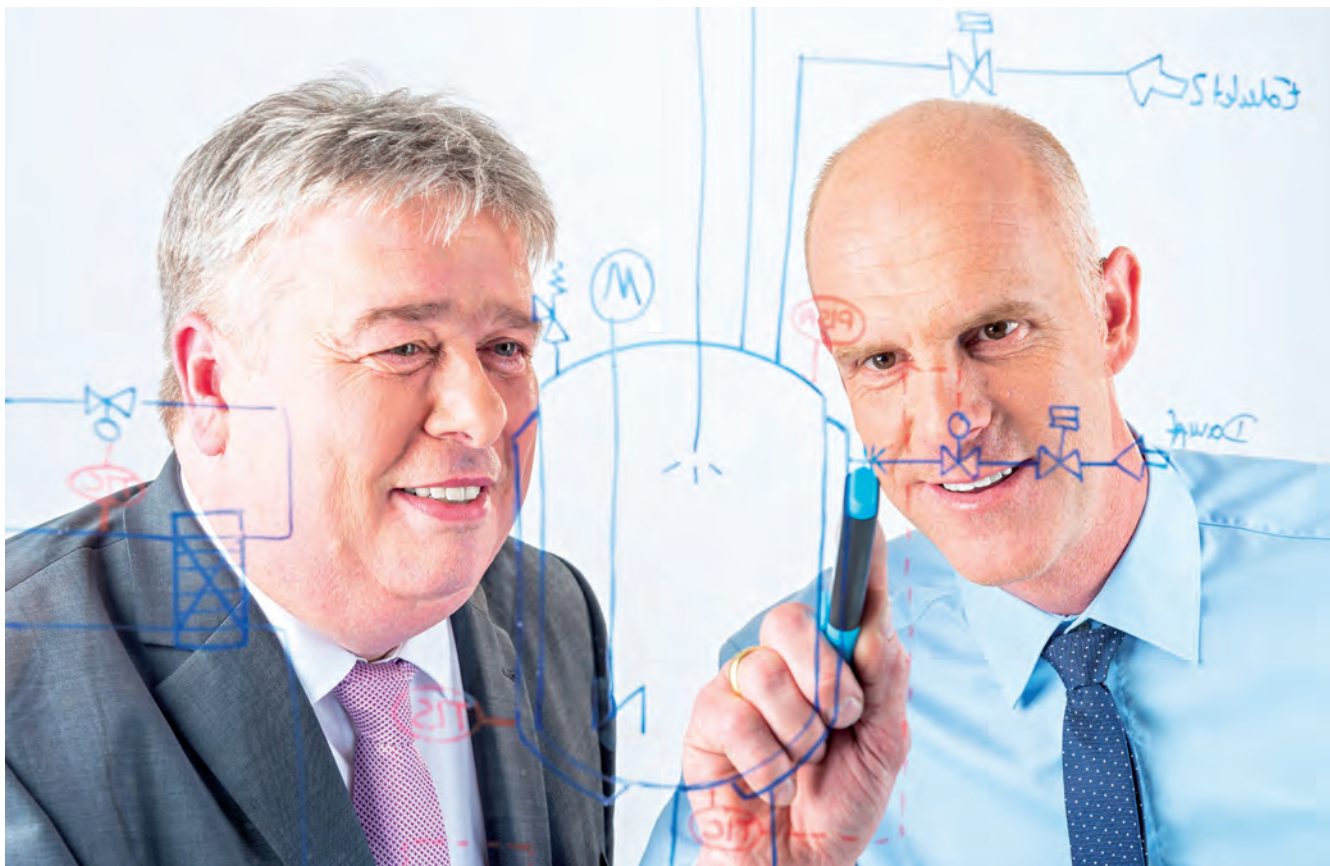
ENGINEERING	Basic engineering Preprocess optimisation Detail engineering
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IMPLEMENTATION	Manufacturing Purchasing Construction (assembly)
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START-UP	Commissioning Validation Documentation
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CUSTOMER SERVICES	Spare parts Service and maintenance Process optimisation
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## SCHRADER – customized solution in focus

We develop customized solutions with apparatus and plants designed specifically for your application. Our engineers and employees with experience in the field of process engineering will design and implement your

individual equipment, fine-tuned to the requirements of your manufacturing situation – a turn-key installation for which we are responsible up to the point where you use it for production.

### PROCESS REQUIREMENTS

- ▶ Reliability
- ▶ Quality
- ▶ Reproducible, documented processes

### SUSTAINABILITY

- ▶ Optimised energy consumption
- ▶ Optimised use and recovery of supply fluids
- ▶ Optimised use of raw materials

### COMPONENTS

- ▶ In-house apparatus and heat exchanger construction
- ▶ In-house assembly and piping construction team
- ▶ In-house measurement and control engineering department
- ▶ Procurement of first rate, tried-and-tested standard or special-purpose components and machines

### EASE OF USE

- ▶ Individual adaptation to local conditions
- ▶ Individual adaptation to working procedures and key functions

## From laboratory processes to the production plants

At SCHRADER, we will develop your production installation on the basis of your process overview. Together with you, we will implement the parameters we have evaluated as a fully featured production plant. Starting with the base data such as pressure, temperature, solvents, dwell times and other details to make full use of the raw material used, we will scale the installation to match a functional plant.

On request, we can include the degree of automation and any necessary documentation in the concept. Our focus is always on the efficient use of energy, product or solvent management and process reliability. We have a guiding principle that applies to everything we do:

**“To achieve a high-quality final product that offers a high standard of production reliability to the satisfaction of our customer.”**





## SCHRADER – Your specialist for high-grade extraction technology

State-of-the-art extraction technology is responsible for making extracts for cosmetic, food and beverage industries. SCHRADER specialises in project planning and the construction of extraction plants and will support you in creating the optimum starting position that will enable you to achieve your production targets. Drawing up individual solutions in factory equipment engineering has been a key factor in our success over several decades.

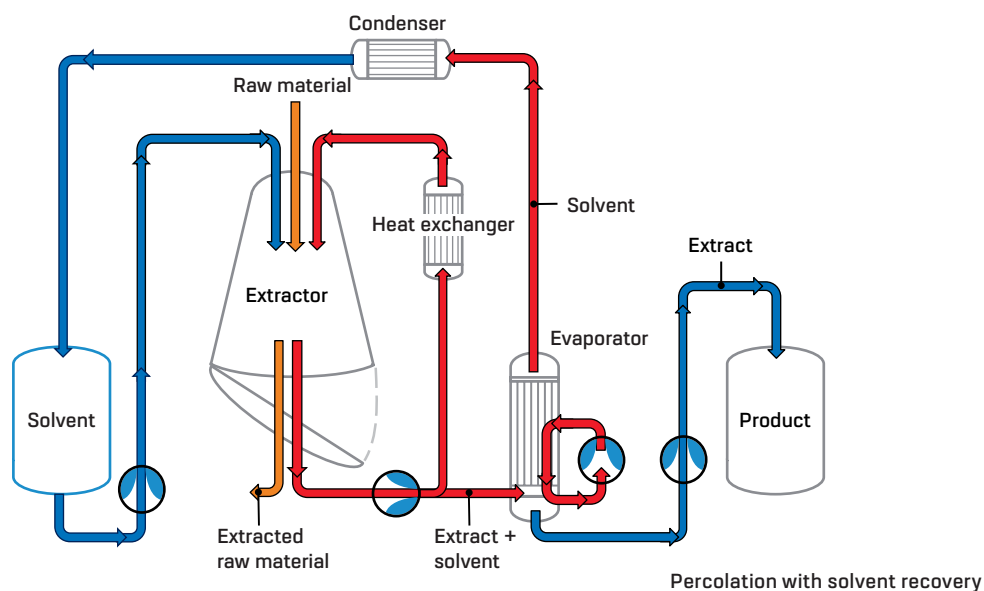
## TYPES OF EXTRACTION PLANTS



The choice of extraction system is determined by the type of product to be extracted and the quantities involved. On request, we integrate upstream and downstream processes, such as evaporation and rectification, in our plant concept.

The most important types of construction are:

- ▶ Batch processes
- ▶ Continuous extraction processes
- ▶ Carousel extractors
- ▶ Multistage semicontinuous extraction





## AROMAS AND ACTIVE SUBSTANCES

Aromas and active substances are considered to be „natural“ if they exist in nature – such as vanilla, which is the world’s most important aroma. The starting material may have a vegetable, animal or microbiological origin. It is possible to extract natural aromas and active substances efficiently with the aid of enzymatic, microbiological and physical processes (e. g. distillation and extraction). On request, we can design the plants in such a way that the production process complies with religious food requirements, such as halal or kosher.



### DISTILLATION | RECTIFICATION | EVAPORATION

#### Technologies

- ▶ Vacuum distillation
- ▶ Pressure distillation

#### Applications

- ▶ Extract concentration
- ▶ Solvent recovery
- ▶ Aroma recovery

In conjunction with an extraction installation, these technologies offer the opportunity to set up continuous extraction processes that have only low solvent consumption.

# PHARMA



## SCHRADER – active substances safely manufactured and prepared

The pharmaceuticals industry insists on the highest achievable standards of quality, traceability and care. For several decades, we have been a reliable partner of this industry. Our core competency here is extracting active pharmaceutical ingredients from vegetable and animal raw materials. SCHRADER offers sophisticated extraction technology, mixing and preparation technology that corresponds to the requirements of the market. We place particular emphasis on qualification, documentation, standards-compliant development and production.



## FOR VEGETABLE AND ANIMAL ACTIVE SUBSTANCES

Whether it is eucalyptus leaves, sage, menthol, camomile blossoms, turmeric or valerian root – medicinal drugs are frequently based on natural substances. Exploiting these active substances, separating them and providing them in a usable form is the task of well-designed processes.

SCHRADER offers numerous opportunities for implementing these processes in state-of-the-art production facilities. Often, the necessary foundation for the process is the steps of extraction, evaporation, rectification and dissolving. The interaction of raw material and solvent is just as critical as individual adjustment of temperature, dwell time, pressure and dosing.

### SOLVENTS

Propane • Butane • Carbon dioxide • Nitrous oxide  
1,1,1,2-tetrafluoroethane

Ethyl acetate • Ethanol • Acetone  
Hexane • Methyl acetate • Butanone  
Dichloromethane • Methanol

1-propanol • 2-propanol

Diethyl ether • Cyclohexane • n-Butanol • 2-Butanol

Water • Vegetable oils

## Mixing and preparation technology

Exact dosing and careful mixing to achieve homogeneous products at a constantly high level of quality is a key task of pharmaceuticals. The design of suitable agitator vessels that fulfil the requirements of the mixing process efficiently is a focal point of our activity when we build pharmaceutical equipment.

SCHRADER installations guarantee safe, verifiable tailored production. „Turn-key“ to us means that SCHRADER provides all the individual project steps – from compliant implementation of the formula through to monitoring and documentation of all parameters.





## **DUE CARE AND ATTENTION DOWN TO THE LAST DETAIL – QUALIFICATION AND DOCUMENTATION**

In the pharmaceutical field, quality and safety are the highest priority. Proper, comprehensive documentation is absolutely indispensable. These steps are based on the GMP guidelines (Good Manufacturing Practices) or FDA regulations (Food and Drug Administration), as appropriate.

Our employees can call on considerable experience and support our partners in the pharmaceutical industry in compiling all the necessary documents. With the aid of a database system, qualification documents are managed and kept up-to-date.

In the pharmaceutical industry, conducting qualification procedures for the facilities, equipment and utilities is a fundamental part of quality management and a precondition for receiving and maintaining production approval.

### **QUALIFICATION**

Qualification and validation involves completing a number of qualification steps relating to the plants, equipment, utilities and processes. The qualification and validation of the plant, equipment, utilities and processes is effected in accordance with EU GMP Guidelines Annex 15.

The following qualification steps are followed by us in all cases:

- ▶ Design Qualification (DQ)
- ▶ Factory Acceptance Test (FAT)
- ▶ Installation Qualification (IQ)
- ▶ Operational Qualification (OQ)
- ▶ Performance Qualification (PQ)



# Process technicalities

The processes and formulas developed in the laboratories are checked to assess their suitability for day-to-day production by us.

Whether it is fluid, solid or gaseous – we match the processes to the properties of the substances used while taking into account their temperature and pressure dependent behaviour. In this way, we ensure that the production, characteristics and handling of complex products is achieved at the optimum quality level and with the best achievable yield.



## PHYSICAL PROCESSES APPLIED

EXTRACTION	EVAPORATION DISTILLATION RECTIFICATION	MIXING DISSOLVING
<i>solid liquid</i>	<i>solid liquid gaseous</i>	<i>liquid liquid</i>
<i>liquid liquid</i>	<i>liquid gaseous</i>	<i>solid gaseous</i>

At SCHRADER, the emphasis is on thermal process engineering using such processes as stripping, dissolving, evaporation and homogenisation.







## EXTRACTION

Types of extraction

- ▶ PERCOLATION
- ▶ MACERATION
- ▶ STEAM DISTILLATION
- ▶ LIQUID-LIQUID
- ▶ SOXHLET

The choice of extraction system is determined by the type of raw material to be extracted and the quantities involved. A broad range of orders of magnitude can be configured. We will be pleased to advise you.

The most important types of construction are:

- ▶ Batch processes
- ▶ Continuous extraction processes
- ▶ Carousel extractors
- ▶ Multistage semicontinuous extraction

Batch extraction offers many unique advantages, e. g.: when it comes to verification, documentation and batch tracking.

## DISTILLATION | RECTIFIKATION

- ▶ Azeotropic distillation using steam
- ▶ Internals to increase the active surface area/ partition stages and packed columns
- ▶ Using an entrainer in azeotropic distillation
- ▶ Vacuum distillation

## EVAPORATION

- ▶ Gentle procedure supported by a vacuum
- ▶ Covering by nitrogen in compliance with EU ATEX Directives

## MIXING | DISSOLVING | HOMOGENISING

SCHRADER specialises in dosing exact quantities, mixing and dissolving them.

Effective interaction of pressure, temperature and kinematics enable peak product quality. To this end, we hand-pick the most suitable pumps, valves, agitators and vessels and combine them to match your specifications.

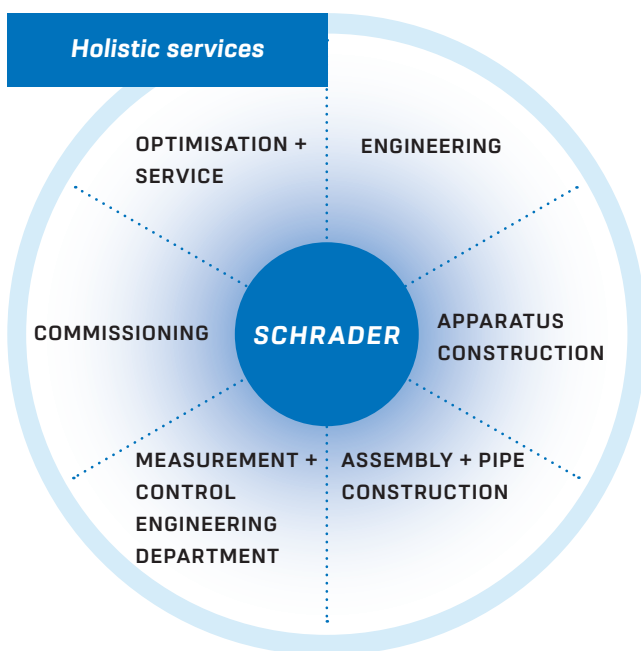
## SUPPORTING PROCESSES

To assure optimum production, additional operations frequently have to be taken into consideration, such as cleaning processes (CIP), heating and cooling processes and condensation processes. We efficiently configure all the necessary workflows in line with the processes and incorporate them in the plant concept.

# Flexibility, quality and technical expertise

## Exploiting synergies – with our holistic range of services

Customer and quality orientated, flexible, communicative and capable – the SCHRADER team is ready for you, and keen to assist you in finding and implementing the best conceivable solution for your specific tasks. Consistently close cooperation between the SCHRADER divisions and their over 200 employees guarantee you will benefit from a reliable, outcome-orientated partnership and a broad range of services from the planning and coordination stage through to hand-over of the turn-key plant.



## SCHRADER apparatus construction

Qualified welding business for high-grade vessels, equipment and apparatuses.

### Focus on:

- ▶ Pressure vessels in compliance with applicable directives
- ▶ Mixing- and agitator vessels
- ▶ Tube bundle heat exchangers
- ▶ Flat tube heat exchangers
- ▶ Special-purpose equipment and apparatuses

Crane capacity up to 23 m  
up to 100 t

SCHRADER is a preferred specialist for innovative, individual, process-optimised solutions in plant engineering – from the prototype through to the finished production plant.

After completion and commissioning, we will continue to be your contact for continuous optimisation and all service matters.







SCHRADER has its own task forces for installing complex plants and for pipe construction.

Our highly qualified staff guarantee first rate plant installation. At the centre of our work is our dedicated aim to meet your requirements. SCHRADER will provide you with a personal supervisor or a complete team on-site.

## CONTROL ENGINEERING AND PROCESS AUTOMATION

From manual mode through to fully automatic

- ▶ Advisory services to determine the necessary plant configuration
- ▶ Process requirements
- ▶ Individual adaptations
- ▶ Options and opportunities – from necessary to convenient

The aim is to provide balanced interaction between the components, control and measuring instruments under production conditions on-site

### Control types:

- ▶ Pneumatic
- ▶ Hydraulic
- ▶ Electric

### Environments:

- ▶ Atex
- ▶ WHG

## CERTIFICATES AND PERMITS

The Companies in the SCHRADER Group have the following certificates and permits:

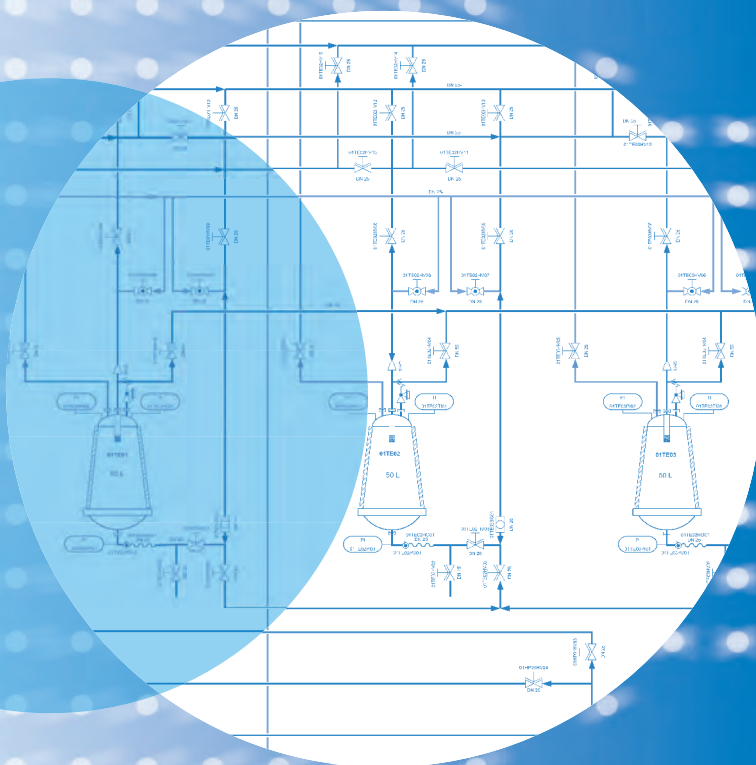
- ▶ DIN EN ISO 9001:2015
- ▶ Pressure Equipment Directive 2014/68/EU Modul, G,A2
- ▶ AD 2000/HPO
- ▶ DIN EN ISO 3834-2
- ▶ Federal Water Resources Act (WHG) Sec.19.1
- ▶ WASME Section VIII Div.1 & Div.2
- ▶ SCC for contractors and manufacturing enterprises

The following standards and EU Directives may be applied:

- ▶ ATEX 2014/34/EU
- ▶ Ghost R Certificat ho
- ▶ Chinese Manufacture License D1, D2
- ▶ GMP
- ▶ FDA
- ▶ CFR title 21
- ▶ EU 10/2011
- ▶ EHEDG
- ▶ GAMP 5.0

Further details on request.





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