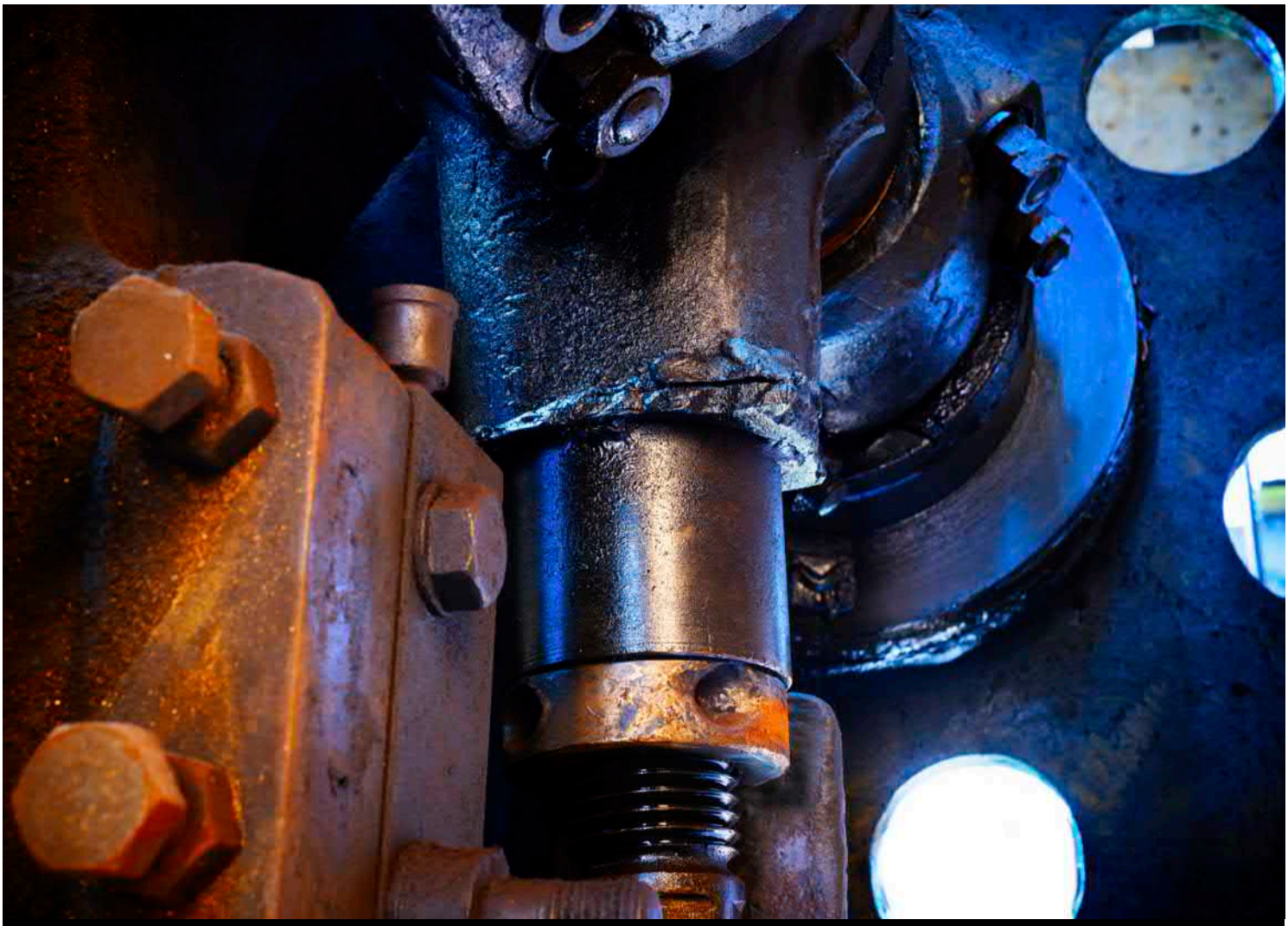


Grease manufacturing plants

Batch and in-line technologies to optimize your production

Process global solutions for grease manufact

Design, engineering and supply of automatic grease manufacturing plants

Backed by a 50 year experience in process engineering and lube oil blending - over 80 Lube Oil Blending Plants installed throughout the world - as well as in the specialty chemicals, polymers and resins industries, ABB offers continuous and batch process solutions for the manufacturing of greases.

ABB designs plants meeting your specific needs, supplies skid-mounted units and provides training and start-up services.

Applications

All types of greases obtained via:

- **saponification**: lithium and lithium complex, calcium and calcium complex, lithium and calcium mix, aluminium
- or **dispersion**: silicium, bentonite

with or without additives or colours.

Benefits

- Modular/flexible and multipurpose units for the production of current greases.
- Automatically operated units.
- Excellent process repeatability and quality control.
- Minimised operational and energy costs.
- Reduced investment costs.

References

The following major international petroleum companies have chosen ABB for their grease production units.

PETROBRAS	Brazil
PETROMIN	Saudi Arabia
SHELL	Belgium, Singapore
TOTAL	China

urers

Optimised design for the shortest Return On Investment

Optimized design

ABB optimises the design of new plants or modernisation of existing ones to give the shortest Return On Investment (ROI) time and to guarantee the plant performance.

Our design is based on the customer production requirements and constraints which include:

- Production portofolio (product slate, required production, formulas, pack distribution)
- Batch size distribution
- Product compatibility
- Raw material characteristics and delivery mode
- Products Lead time and peak demand
- Layout (existing buildings)

The design methodology specifically developed by ABB for grease production plants, and supported by specific design tools, can be applied at the different steps of the project from feasibilty study up to turn-key unit design.

Our services include:

- Conceptual design
- Basic engineering
- Detail engineering
- Equipment design and supply
- Erection supervision and start-up
- Training and technical assistance
- Software telemaintenance services
- Automation of existing plant

1 Pressurized batch reactors | 2 Powder dosing hopper with bag emptying | 3 Drum filling line | 4 Pig launching station, heat traced and insulated

Batch and continuous grease manufacturing p

Batch and continuous grease manufacturing plant with common storage tanks and filling lines

Cellier Activity delivers complete units from the storage and delivery systems of raw materials to the filling and packaging systems, including transfer systems and utilities. These units integrate saponification reactors offering excellent performance in terms of mixing, thermal transfer, easy cleaning and maintenance.

Batch manufacturing process

The batch greases manufacturing process includes the following phases:

- **metering and addition of reactants** (fatty acids, base oils, water, alkali, metal hydroxides). As the reactor is equipped with a high dispersion mixer, the raw materials could be use directly in powder.
- **saponification** run in a reactor/kettle operating at atmospheric pressure or as a pressurized kettle to convert the fatty acid and alkali to soap and disperse the soap throughout the mixture;
- elimination of reaction water;
- **cooling** by base oil addition and thermal exchange;
- **homogenisation or milling** to break agglomerated particles, adjust the grease consistency and produce a smooth and stable product;
- eventually **filtering**;
- **in-line deaeration** to remove air entrapped,
- filling.

To add special properties to the grease, other ingredients may be introduced, such as oxidation inhibitors, anti-corrosion and anti-wear agents. This **additivation** step is completed in a finishing kettle where the deaeration of the product may be completed.

In-line manufacturing process

Designed for the production of large volumes, the continuous grease manufacturing unit developped by ABB is fully automated and able to produce various types of greases, 24h/day. It consists of an **in-line reactor** combining the operations of saponification (heating and reaction), water elimination, dilution/homogenisation and cooling. The in-line grease reactor works directly with powders. Thus less water is introduced in the product and as a matter of fact, less water comes out.

rocesses to produce a wide range of products

Capable of a fast production start-up due to a reduced heating time, the in-line reactor is also easy to stop and has a very low product build-up (< 40 kg). Product changes are facilitated and result in very low product losses. Other advantages of the in-line reactor are:

– Compactness of the process area
– Cleanliness of the grease workshop
– Improved process control.

An in-line additivation takes place downstream from the reactor, before the finishing step in a storage kettle. Milling is done in a circulation loop on the finishing kettle. Then, prior to filling, the grease is filtered and eventually deaerated.

Controlled heating/cooling parameters

The key to the process control, productivity and quality lies in the mastering of thermal exchange systems. An accurate heating system for the reactor, and the cooling of the finished product enables:

– reduced heating/cooling times,
– fine product temperature regulation with +/- 1°C accuracy,
– high velocities of the heating/cooling medium,
– elimination of thermal shocks,
– reduced operational costs,
– secured process and improved safety.

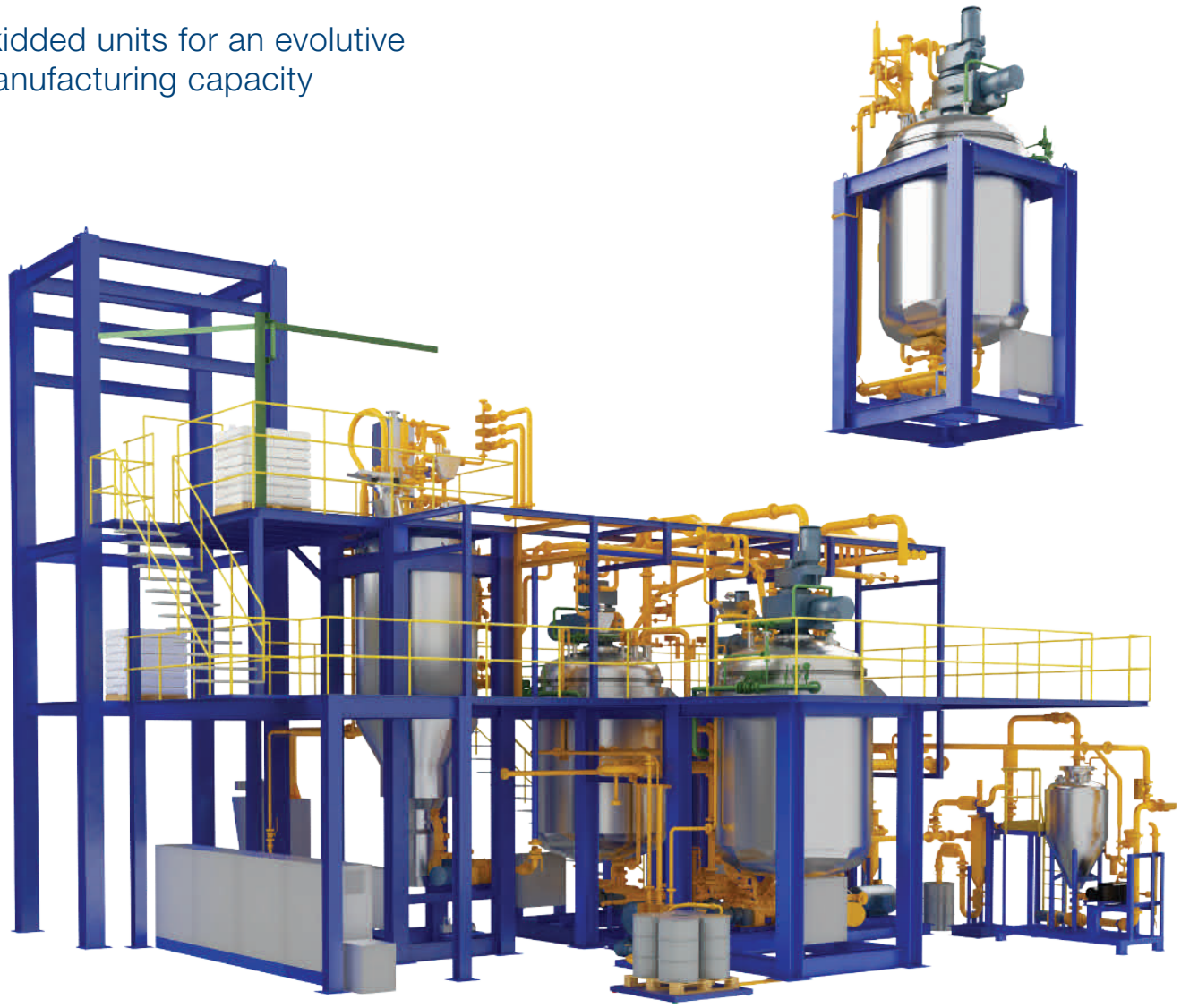
State-of-the-Art equipment

According to grease manufacturer's specifications, our process design integrate solutions from the grease industry's leading equipment suppliers and our own state-of-the-art equipment which contribute to the plant reliability and flexibility, such as:

– batch or in-line reactors,
– finishing kettles,
– self-cleaning filters,
– pigging systems.
– drum decanting systems,
– production monitoring systems.

Modular approach

Skidded units for an evolutive manufacturing capacity



The units can be delivered as skidded units, fully assembled and ready for operation, including valves, fittings, control instruments, utilities and thermal insulation, for ease of installation and to meet customer location constraints.

Application

- Capacity from 3,000 to 15,000 TPY
- Production of various types of greases, including complex, mixed ones

Benefits

- Optimised layout
- Easy installation in minimised time and with less workforce and lifting devices
- Steel structures, platforms, staircases are included in the supply
- Modules are tested in our workshop before shipment, including electrical and automation systems
- Easy and quick start-up reducing commissioning and test phases
- Modules can work as standalone equipment or interconnected
- Facilitated capacity expansion by the addition of new modules
- Easy dismantling and shipment in containers
- Optimised investment cost and payback.

Extended process control

Greacel™: Process control and plant scheduling software

Greacel™

Greacel™ is a powerful control system for batch and in-line production monitoring and management which perfectly fits the requirements of lube oils or grease manufacturers. It ensures the entire management of raw materials, product formulation, recipes, ressources, inventories, production and cleaning sequences. Parameter setting enables Greacel™ to optimize the production.

Greacel™ can be extended to encompass the control and supervision of all the operations within the plant, from raw material reception and storage to product dispatch (raw materials metering, saponification, water elimination, finishing, cooling, deaeration, filling). It is a plant-wide control system integrating sub-systems such as graphics, workshop capabilities, warehouse management, advanced schedule features. It has no limits in communicating with other systems such as lab or business systems (ERP).

Greacel™ is able to be integrated with the majority of PLCs or controllers. With Greacel™ you will achieve the total process control and plant scheduling software integration of your production system.

Syncel graphics module

Syncel graphics module is a SCADA system sharing common database with the Greacel™ solution. It includes a complete integrated synoptic screen maker.

Workshop capabilities

Greacel™ enables the management of manual operations through deported industrial PC, WIFI tablets PC.

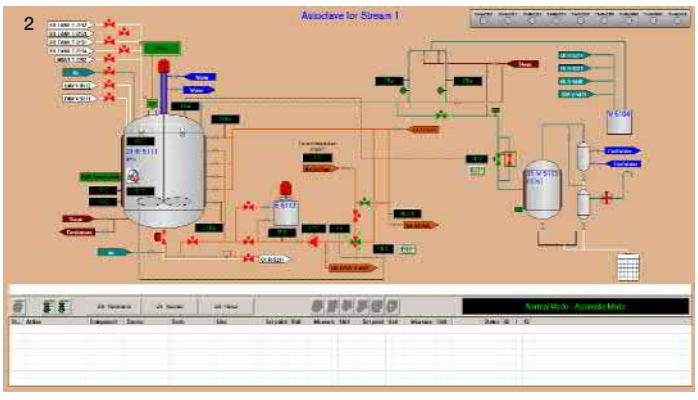
Advanced short-term scheduling module

Greacel™ indicates the daily load for each manufacturing or filling resource or workshop (reception, production, filling). This short-term scheduling module is a powerful tool for smoothing the load.

Histcel historics module

Greacel™ enables information from the previous year's production data records to be retrieved for data tracking purpose and to perform analysis or to get some trends. The results of multi-criteria searches can be exported in Excel format files in order to manipulate the records with standard tools.

1 Control room | 2 Synoptic screen



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