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The control system for butter churns and butter processing lines

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Part way

Many of the older butter churns have been converted in the eighty years from DC or hydraulic drives to AC motors with frequency converter, which is state-of-the-art technology.
It is now time for a modernization to ensure profitability and safety in the future.
Thus this you prevent typical unexpected costs, caused by production downtimes, inefficiency and quality problems.

BUMACON – for more safety, quality and profit

The BUMACON-control system is an excellent starting point. The powerful system masters all process parameters to boost the efficiency of your manufacturing facilities in all aspects to secure and maintain the highest level of quality. Comply with the HACCP-directives, optimize the raw material usage, improve labour costs, comply with legal requirements and make operational tasks much easier.

Don´t do things by halves – take the complete step!

The ten commandments for more productivity

- BUMACON optimizes not only the older butter churns, but also new machines which are tuned to this trend-setting state-of-the-art technology
- optional utilization of fat through optimized process parameters
- compliance with legal requirements – in particular the moisture content – thus continuous and accurate measuring and controlling of the relevant processes
- the spreadability of the finished product is enhanced through optimized process guiding
- the highly automated process sequence is tying less personnel and therefore creates more utilizable resources
- self-explanatory operating interface with touch screen minimizes mal-operation and down times
- enhanced CIP sequences for fully integrated and flexible CIP of all equipment
- integrated quality management system – all measured values and process parameters are recorded and may be used in whatever format required for management information and diagnostic work if required
- standard hardware and software tools are used to guarantee the operating stability and spare-part procurement
- the BUMACON is also available with integrated moisture measuring and control system (H2OMCON)

Scope of supply of BUMACON

Operational readiness with immediate readiness – this is our aim. Therefore BUMACON consists already of the following standard equipment:

- completely mounted in stainless steel housing
- a PLC for the machine level, based on a Siemens, Mitsubishi or Allen Bradley
- bus-coupled input and output system
- TFT-color-display for visualization and operating level for standard PC´s, equipped with MS-operating system. Therefore, user input is as simple as touching the display screen.

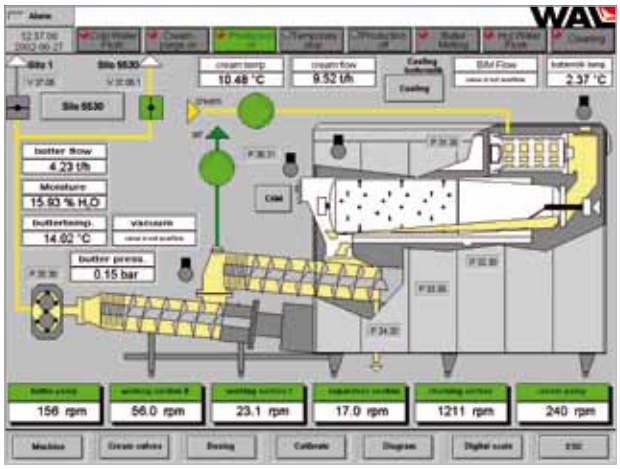
Recommended Option:

- high speed microprocessor system for dosing and online-moisture measurement

Standard features

- **How to optimize your production?**

The following description explains the most important standard functions of BUMACON in detail.



- **Revolution speeds – registration and control**

The revolution speed of all motors within the machine is controlled by frequency inverters. The actual revolution speed – as well as the slip compensation of the inverters – are monitored continuously and where necessary to accurately maintain the set-point.

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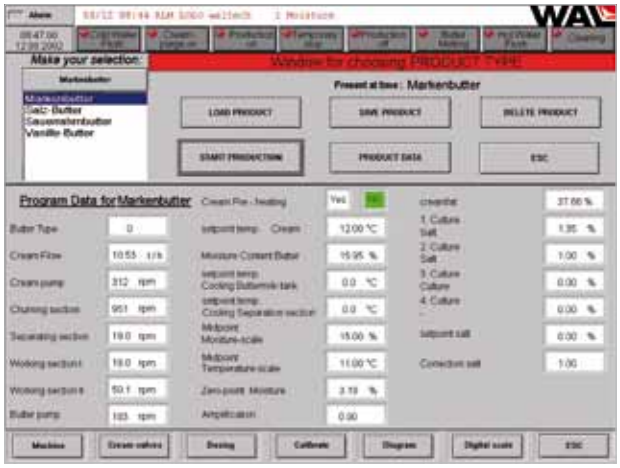
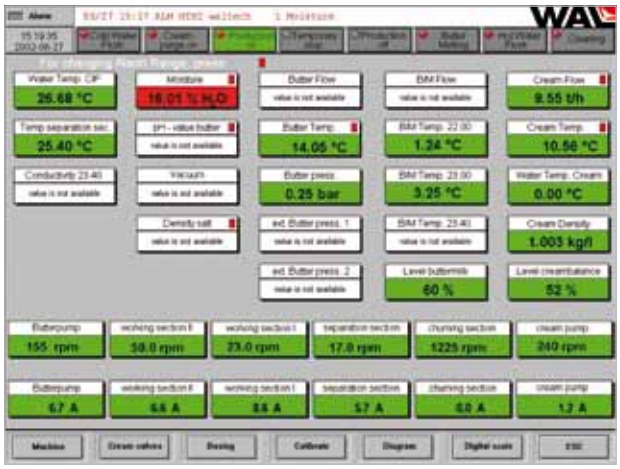
Recipe handling – data base for rapid change-over of product

All set points and operational settings of the machine and the dosing device are administrated in an internal database and may be stored under the respective product names. Therefore, a start-up or change-over to another product is carried out much faster than usual.



Quality assurance – meet the QM-directives

To meet the QM-directives, all measured values, revolution speeds and parameters are displayed both digitally and graphically on the screen to promote ease of control and data comprehension. Additionally, every second, all values are stored on the hard disk of the PC and may be referred to anytime over 24 months.



Automatic CIP control – complying with HACCP´s

The fully integrated CIP-sequence complies with similar state-of-the-art technologies to meet the most stringent of HACCP requirements. The optimized CIP-programs provide greater cleaning efficiency to promote improved product security and longer production runs.

Special features

BUMACON – additional options for individual adaptation on your production

The BUMACON control system may be systematically adapted to your specific requirements and is capable of further changes or additions that may be required in your process over the coming years.

Control of cream level – constant levels

(Option: XOPTBUMRLC)

The level of the balance tank should be maintained at a constant level to ensure an optimal feed of cream to the feed pump. This is carried out by PID-control of the cream feed pump using frequency inverter and accurate level measurement in the balance tank.

- **Control of cream flow – consistency of feed supply**
  (Option: XOPTBUMRME)

To achieve a consistent churning of the cream – and hence a minimum variation in the basic moisture content of the butter – a constant flow of cream to the churn is essential. The revolution speed of the cream supply pump is automatically controlled, based on the flow rate as measured by a magnetic inductive flow meter. An accuracy of < 0,2% is achieved.

- **Mass flow meter and density measurement – Coriolis-Principle**
  (Option: XOPTH2ORMA)

Optionally the cream quantities may also be measured using a mass flow meter (operating according to the Coriolis-principle). In this case the processed quantity is directly measured with a typical accuracy of < 0,1%. Thus an even greater consistency of cream flow to the churn also improves the accuracy of dosing and measurement for yield monitoring purposes. Additionally the density of cream is also measured.

- **Cream preheating – consistent churning**
  (Option: XOPTBUMRAW)

The preheating of the cream to churning temperature takes places in the normally existing cream preheater, which is optimized by specific modifications for an improved control. The utilization of a cascade control unit for operating the steam valve as well as the adaptation of the PID-parameters according to the flow rate and high response temperature monitoring are the key aspects. The standard deviation of the cream temperature compared to the desired value is in the range of 0.02 K. Therefore, a more consistent churning and hence consistent basic moisture content is achieved.

- **Control of buttermilk level – constant levels**
  (Option: XOPTBUMILC)

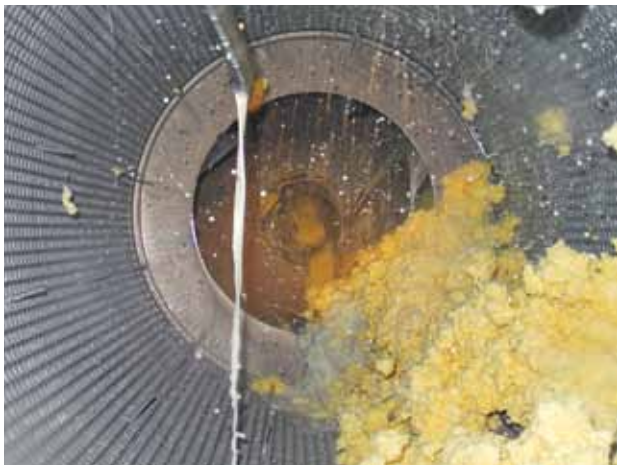
To maintain a constant buttermilk discharge with minimal temperature variation, the level of the buttermilk in the balance tank has to be kept constant. This is carried out by PID-control of the buttermilk discharge pump by means of frequency inverter and accurate level monitoring in the tank.

- **Control of buttermilk cooling – more influence of cooling and basic moisture**
  (Option: XOPTBUMIME)

The quantity and temperature of the returned buttermilk to the churn is of great importance for the cooling efficiency and stability of the basic moisture content of the butter. The control of buttermilk flow and temperature is carried out with a PID-Controller and magnetic inductive flow meter.

- **Control of mass flow in working section 1 – variable throughput of butter**
  (Option: XOPTBUKN1)

To attain a consistent moisture content of the butter, the throughput in the working sections should be closely controlled. The product level is measured and the size of the openings on the sliding gate to the vacuum chamber is automatically adjusted with a PID control loop.



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- **Control of vacuum – for a consistent product suitable for packaging**
  (Option: XOPTBUMVAK)

The desired level of vacuum is entered in the recipe or control screen. An electronic pressure transmitter continuously checks the actual value and controls a diaphragm valve by means of a PI-Controller. Thus, the required vacuum level remains constant within a range of 0.02 bar. It is measured as absolute value in order to minimize day to day variations. From a quality viewpoint it is important to minimize the residual air content of butter and achieve a constant density of product for packaging (volumetric filling).

- **Control of mass flow in working section 2 – steady level of butter in the vacuum chamber**
  (Option: XOPTBUKN2)

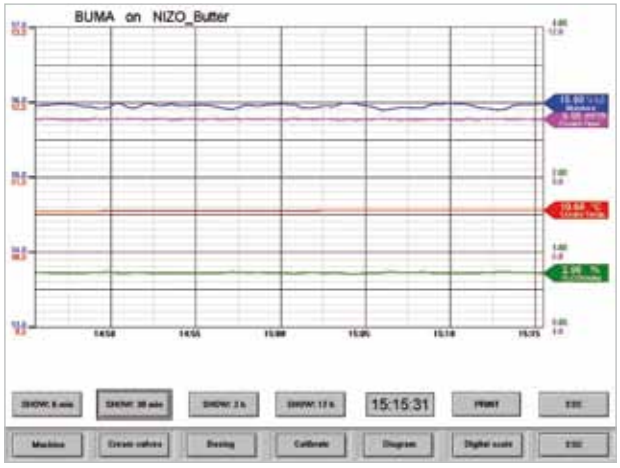
The attainment of a constant level of butter in the vacuum chamber takes place by means of a corresponding level measurement. By means of PID-control the revolution speed of the connected butter pump is adjusted.

- **Butter pressure – bacteriology safety**
  (Option: XOPTBUMBPU)

The pressure at the end of the second working section is being measured by means of an electronic pressure transmitter. The revolution speed of the pump is automatically adjusted to maintain a constant feed pressure to the pump. This promotes ease of operation and constant flow and is much safer in bacteriological aspects than former systems.

- **Moisture measurement and control – continuous measurement of moisture and automatic dosing**
  (Option: H2OMCON)

The online moisture measuring system continuously and accurately measures the moisture content of the butter. The input and storage of the readings takes place within the churn control system. Values are displayed and stored for further interrogation or yield purposes. This information is utilized to control the dosing of culture, salt and water according to churn throughput and fat percentage of the cream. Monitoring of all dosing pumps by means of magnetic inductive or mass flow meters is available as option.



- **Video camera – visual observation of level and churning operation**
  (Option: XOPTBUMVI1)

A video camera allows the operator to easily check the actual level of product in the first working section. The color pictures are integrated into the visualization system on screen.

Conductivity measuring – optimized CIP sequence with protocol

(Option: XOPTBUMLF1)

For optimization and safe-guarding of the CIP sequence, the temperature conductivity and flow rate are continuously monitored and recorded during the entire process. After each cleaning process a record can be obtained for QM verification.

Automatic dosing of detergent – ensuring safe and accurate dosing

(Option: XOPTBUMLF2)

As addition to the above mentioned conductivity measurement the detergent supply can be carried out automatically by means of a metering pump for detergent. Included in the program is an option for detergent top up should the strength drop below the conductivity level specified on the return CIP liquid.

Production data acquisition – all relevant data recorded

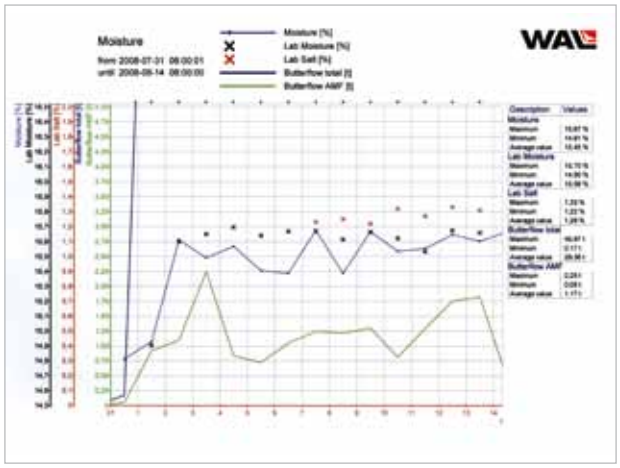
(Option: XOPTH2OBDE)

Statistical values, such as quantity of cream supplied per shift, the amount of butter produced, the average moisture content, the standard deviation of moisture and consumption of the dosing media are displayed on the screen and printed out as hard copy if required.

Statistic and reporting package – the memory

(Option: XOPTH2OBDA)

Various combinations of statistics in numeric or graphic version, e.g. per day, week, months or year may be obtained by using this program. Also manual inputs like moisture and salt test results from the laboratories and any reason for stop / breakdown are included in the printouts. Maintenance intervals and reminder for oil change of motors and valves may be listed also in the report.



Remote maintenance – Service up, expenses down

(Option: XOPTH2OLLW + XOPTBUMTEL)

A modem can be used for monitoring the PC and also the PLC from WAL head office to carry out malfunction analysis. Thus minimization of possible down-times and service costs are reduced. A software update may be made as well.

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