SOPAT

Smart Online Particle Analysis Technology

What's Inside Your Chocolate?

Cocoa - Tempting Natural Product

Cocoa is a natural product which differs in hardness, exact composition and quality.

The optimal milling time is changing from batch to batch and country of origin. But the consumer expects to get the same high quality product every time.

Therefore, control is needed for optimal results in cocoa manufacturing and chocolate producing industry.

Size and shape of the solid cocoa and sugar particles within the cocoa butter matrix affect the perception, quality and finally the cost of the product.

Other ingredients like milk powder, nuts or waffle pieces also determine quality of chocolate, nougat or fillings.

Detect and measure size and shape in-line, right within the production process:

- Cocoa Particles
- Cocoa Powder
- Cocoa Butter Crystals
- Sugar, Milk Powder
- Nuts & Waffle Pieces
- Impurities

Achieve the perfect mouth-feel experience for your chocolate through smart particle sizing.

ChocoScope - The Solution

SOPAT developed and optimized a powerful tool to characterize solid particles in cocoa liquor: the ChocoScope. Size and shape of particles like cocoa, sugar, milk powder, nuts and waffles can be analyzed inline without sample extraction or dilution. The automatic image analysis software provides information (in real time) on number and volume weighted particle size distributions (PSDs) and calculates various useful and commonly used values like the x_{v50} or x_{v90}.

Product Category	**SOPAT VI**
Product Model	**ChocoScope**
Measurement Range [µm]	1.5 - 350
Field of View Diameter [mm]	0.8
Tube Length [mm]	220
Tube Diameter [mm]	12
Pressure Range [bar]	0.1 - 40
Probe Temperature Range [°C]*	-10 - 130
Periphery Temperature Range [°C]	0 - 40
pH-Level	0 - 14
Probe Window Material	Sapphire Glass
Probe Tube Material	1.4404 (316 L)
Probe Housing Material	
Weight (without Cable) [kg]	6
Focus	Electronic
Picture Rate [Hz]	15
Picture Resolution [MP]	5
Power Input [VA]	140
Certifications	CE, IP65, CIP/SIP, RoHS

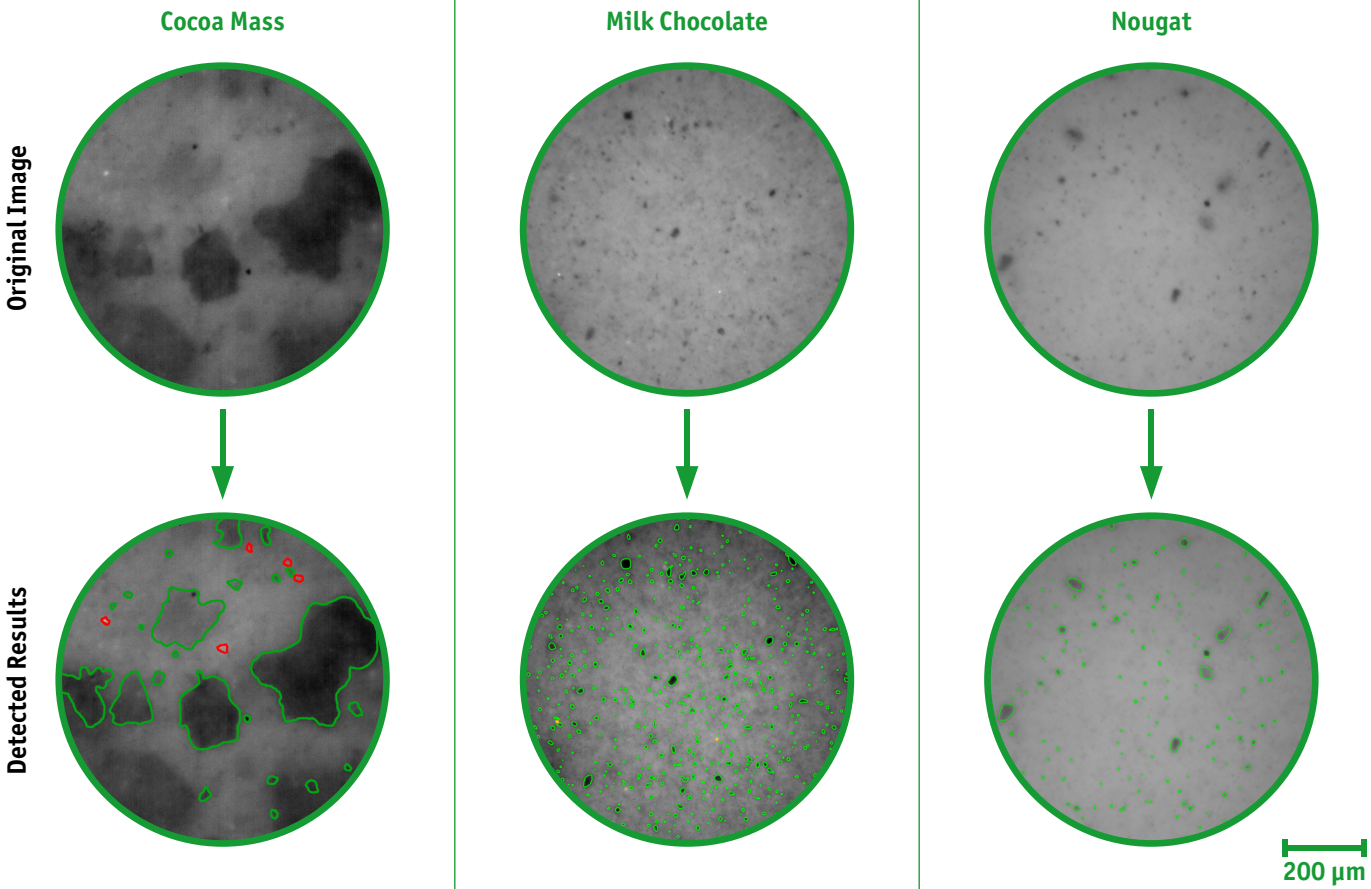
*Probe Components in Contact with Product (Probe Tube & Window)

Use of the ChocoScope

Cocoa particles in cocoa liquor are broadly distributed in size and need to be milled for subsequent use.

In chocolate products, particles (cocoa, sugar, milk powder) should not exceed 30 µm in size to achieve a pleasant mouthfeel.

In fillings the particle size of nuts, waffles or other ingredients stongly determines the mouthfeel of the final product.



Follow the particle size distribution in cocoa liquor to optimize the milling process and save energy and resources.

Characterize the chocolate before conching to obtain the required flow properties and the best product quality.

Particle analysis can also be applied for nougat, in fillings, or in other chocolate products, and helps to improve product development and quality control.

What's Inside Your Chocolate?

Imaging

Imaging:
Photo-optical techniques are able to identify different kinds of particles according to their optical properties.

Visualization:
Images reveal what's inside your chocolate. Cocoa, sugar, milk powder, nut pieces or other particles differ in size, shape and color and can be differentiated.

Quantification:
The ChocoScope combines the visual information with quantitative results from automated image analysis.

Data Acquisition

Data Treatment:
Starting from the original image, different steps of pre-filtering and background subtraction bring out the individual particles.

Analysis:
The underlying algorithms can be used to differentiate particles according to their grey value, size and shape (see image below).

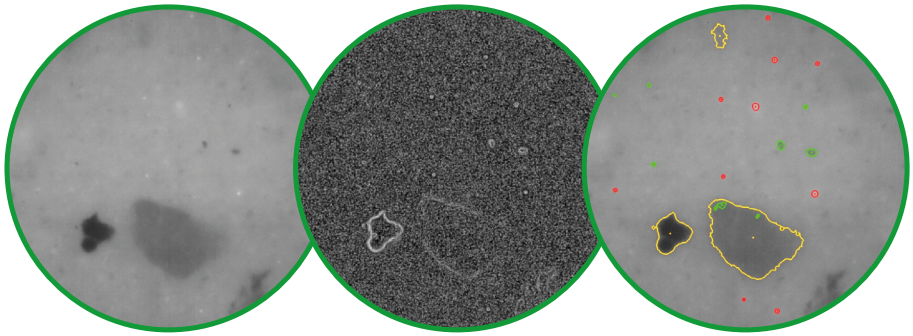
An Example:
In the image below three particle fractions were analyzed individually: small dark (marked in green), large dark (marked in orange) and bright particles (marked in red).

Process Control

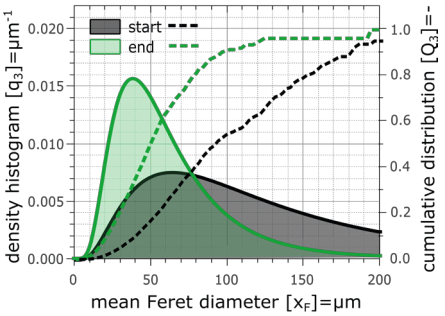
Interpretation:
Particle size distributions can be obtained inline by analyzing the images.

Process Control:
SOPAT's combination of stroboscopic image acquisition and simultaneous analysis enables a continous process control using the ChocoScope.

Standardized:
SOPAT's automated image analysis detects particles and quantifies size and shape according to ISO standards: ISO 13322-1-2014, ISO 12322-2-2006.



1. Original Image | **2. Pre-filtered, Normalized Image** | **3. Object Classification**



4. Particle Size Distribution

Fig.: Images from cocoa liquor were acquired and analyzed to get quantitative data for optimal inline process control.

Improving Chocolate Production

SOPAT offers an allround solution for different usages in cocoa, chocolate, confectionary and bakery industry.

Integrate SOPAT's ChocoScope directly into your production line:

Phase 1
Measure Particles Inline

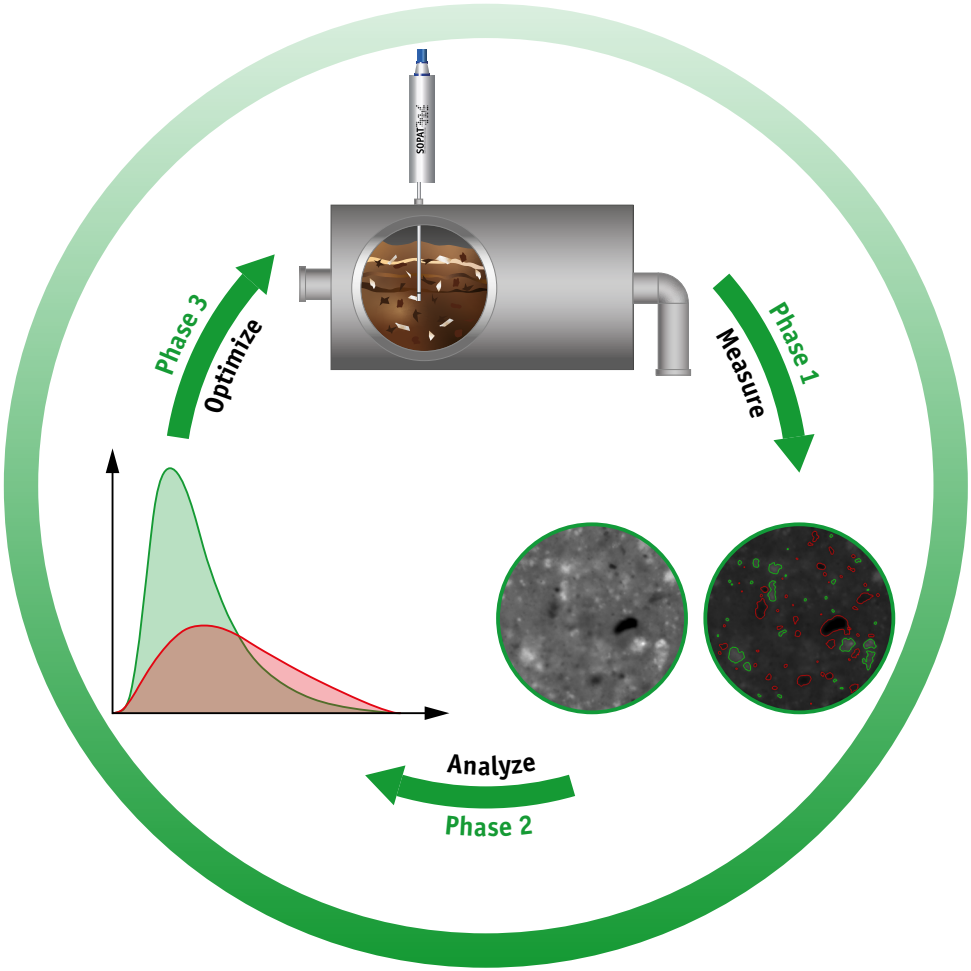
- Inline particle analysis requires neither sample extraction nor preparation like diluting, filtering, or even dispersing.

Phase 2
Analyze in Realtime

- Analyze bright and dark particles individually and get quantitative results.
- Track variations in particle size distribution and shape to obtain characteristic percentiles like x_{v10}, x_{v50}, x_{v90} and x_{n10}, x_{n50}, x_{n90}.

Phase 3
Optimize Your Production

- Avoid overmilling to limit the amount of cocoa butter to be added.
- Detect product particles, foreign particles or aggregates.
- Save energy, natural resources and costs of production.
- Ensure to get the persistent quality of the product, despite the fluctuations of raw product properties.



Integration into Production Line

The ChocoScope can be inserted at several positions in the production line according to the individual production conditions and the need to avoid contaminations.

The design of the probe with a tip diameter of 12 mm and a tube length of 220 mm enables a comfortable integration into your existing process.

The ChocoScope fulfills CIP/SIP requirements.

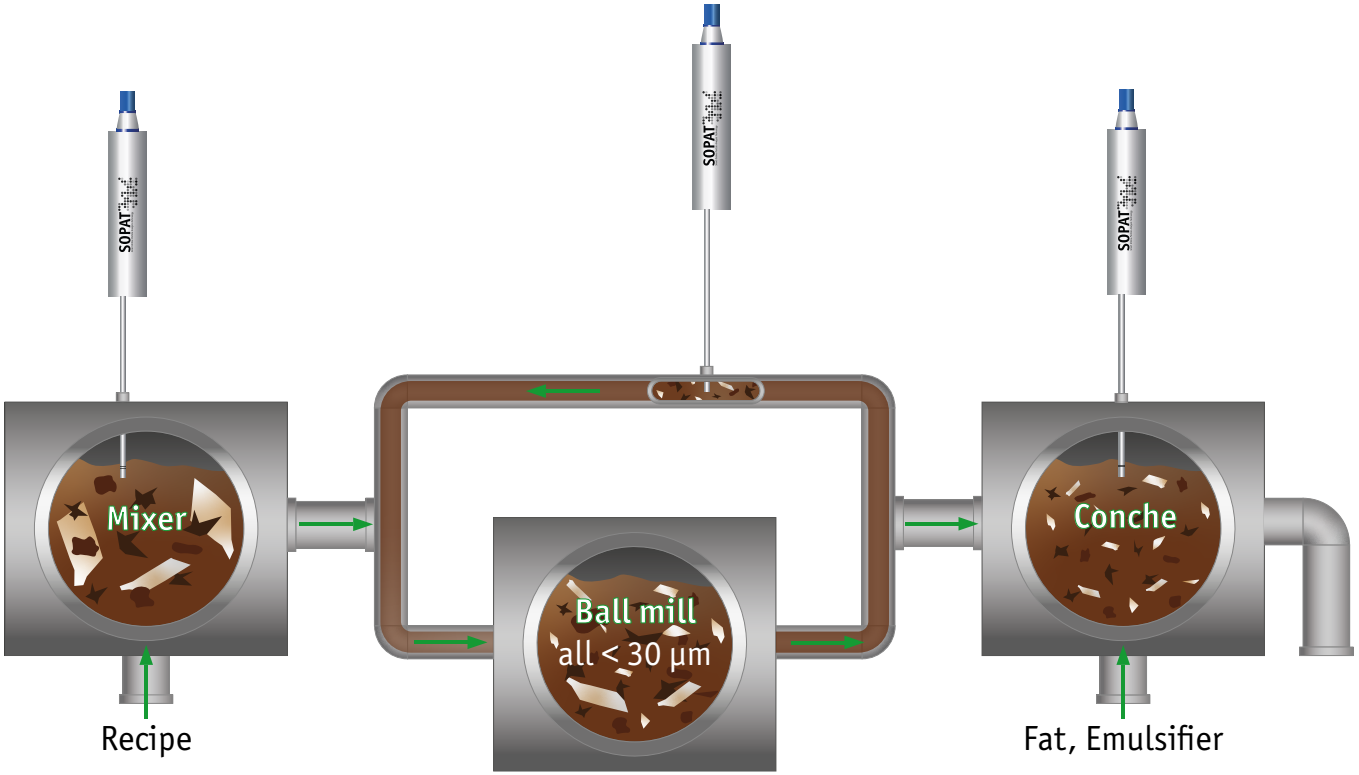
Easy connection to your process control system (PCS) via Modbus TCP/IP, OPC UA or others is given.

The modular design of the individual components (probe, central box, computer) allows an easy handling.

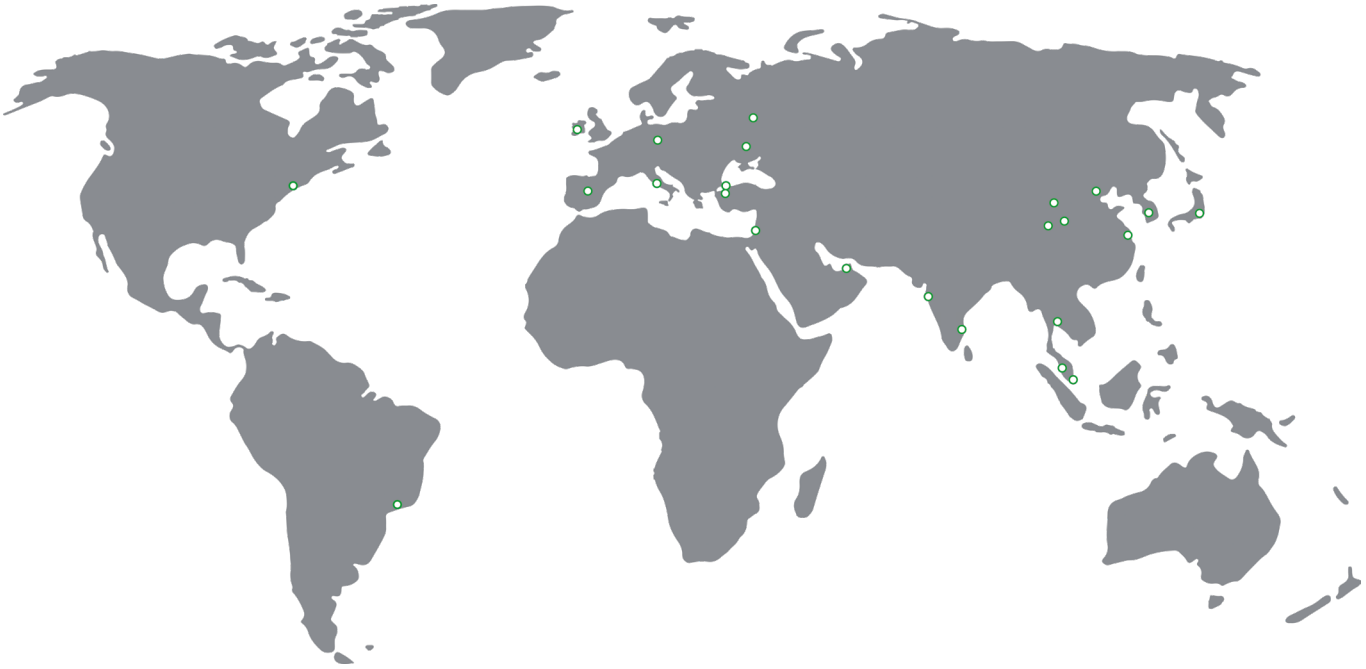
The system is FDA compliant according EC 1935/2004.

The ChocoScope is easy to clean.

As an example: The ChocoScope can be inserted at the exit of a ball mill refiner. This enables **inline** monitoring of the product's particle size and shape evolution and **real-time** process control of critical variables such as time and temperature.



SOPAT - Globally Active Thanks to a Strong Sales Network



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