TRANSFORMING
MATERIALS
INTO VALUE

BHS
SONTHOFEN

CLEAN-IN-PLACE:
BHS MEETING THE REQUIREMENTS IN THE CHEMICAL, PHARMACEUTICAL AND FOOD INDUSTRIES

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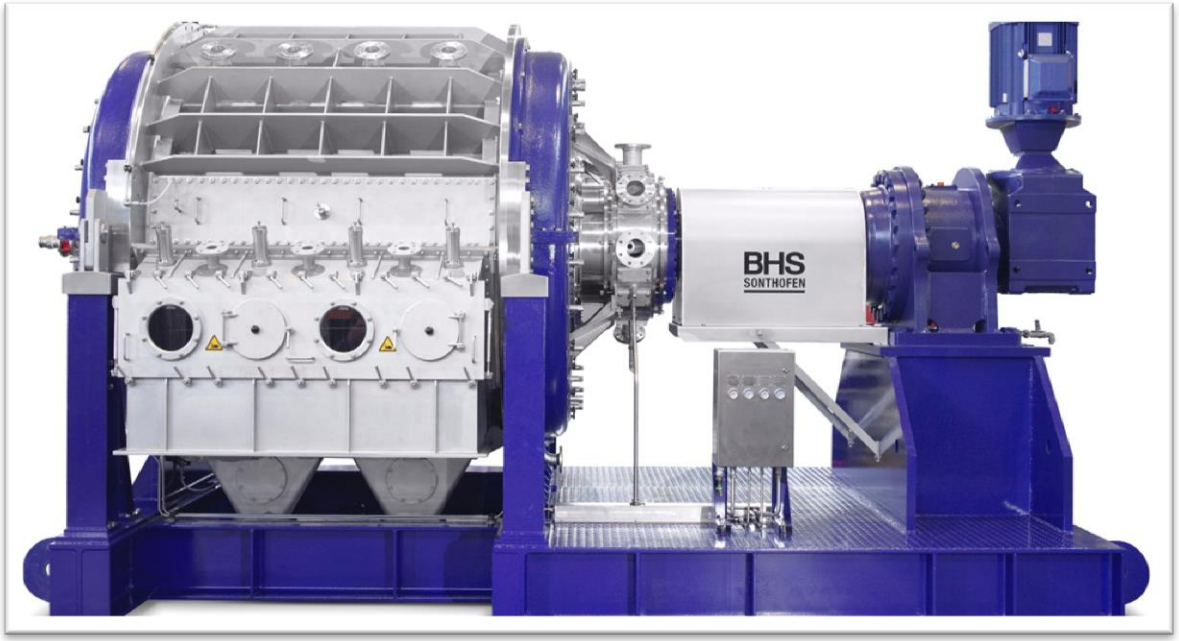
BHS Rotary Pressure Filter: Chemical, Pharmaceutical and Food Applications



BHS-Sonthofen GmbH Location

BHS-Sonthofen GmbH
Divisions

Mixing Technology

Recycling Technology

Crushing Technology

Filtration Technology

BHS-Sonthofen Inc., Charlotte, NC
Filtration, Mixing & Recycling

- New Location for three divisions
- 14,000 ft² Facility Office, Laboratory and Warehouse
- $1.3 million Investment

BHS Technology Portfolio

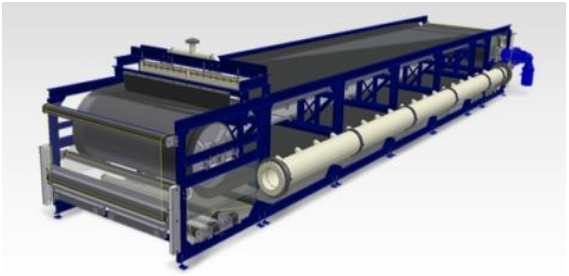
- Pressure & Vacuum Filtration
- Batch & Continuous Operation
- High Solids to Clarification
- Cake Washing & Drying
- Automatic Discharge
  - Wet Cake
  - Dry Cake
  - Concentrated Slurry

BHS Filtration Technology Portfolio

Rotary Pressure Filter

Indexing Belt Filter

Rubber Belt Filter



Candle Filter

Pressure Plate Filter

Autopress

SELECTION OF FILTRATION TECHNOLOGY

CAKE STRUCTURE /PROCESS PARAMETERS FROM LAB TESTING

- Filtration Pressure
- Cake Thickness
- Filter Media
- Cake Washing
- Cake Drying
- Cake Discharge
- Cycle Times
- Process Guarantees

BHS Laboratories: Charlotte, NC / Sonthofen, Germany

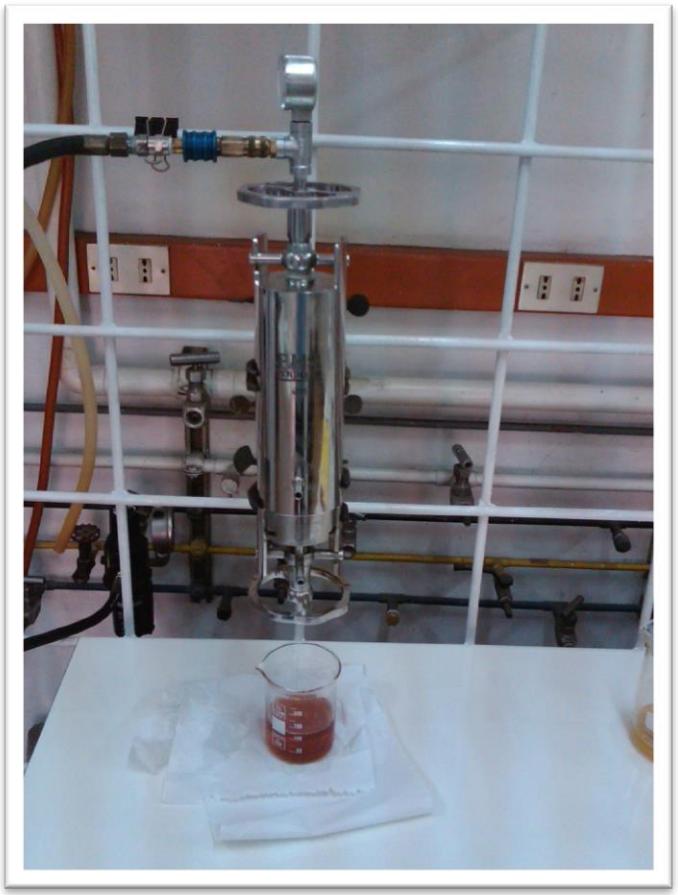
BHS Lab Testing

BHS-Pocket Filter

20 cm² filter area

400 ml content

BHS Lab Testing: Pressure or Vacuum



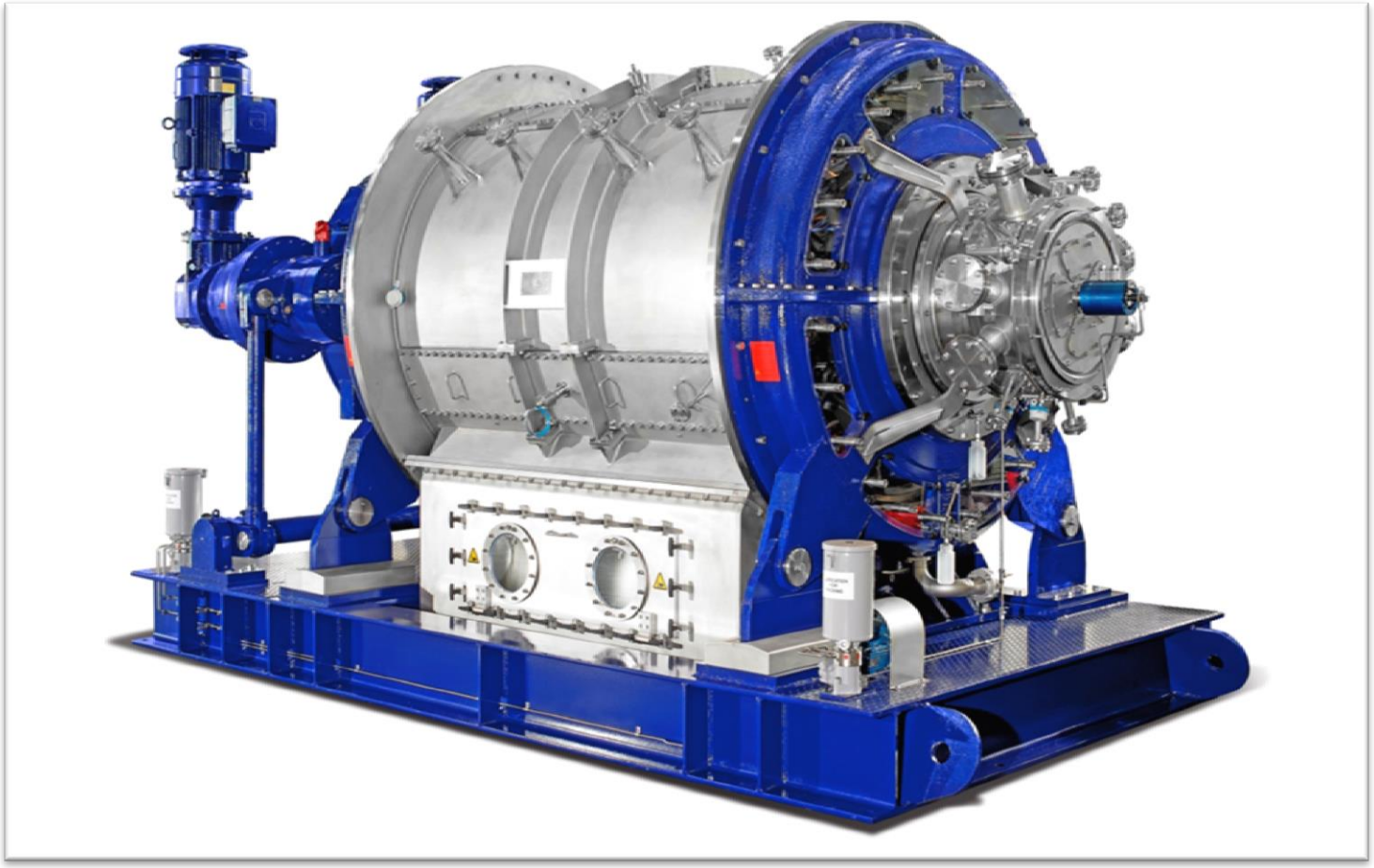
BHS Lab Testing: Pressing – Drying for Vacuum

Air for Pressing For Vacuum Filtration

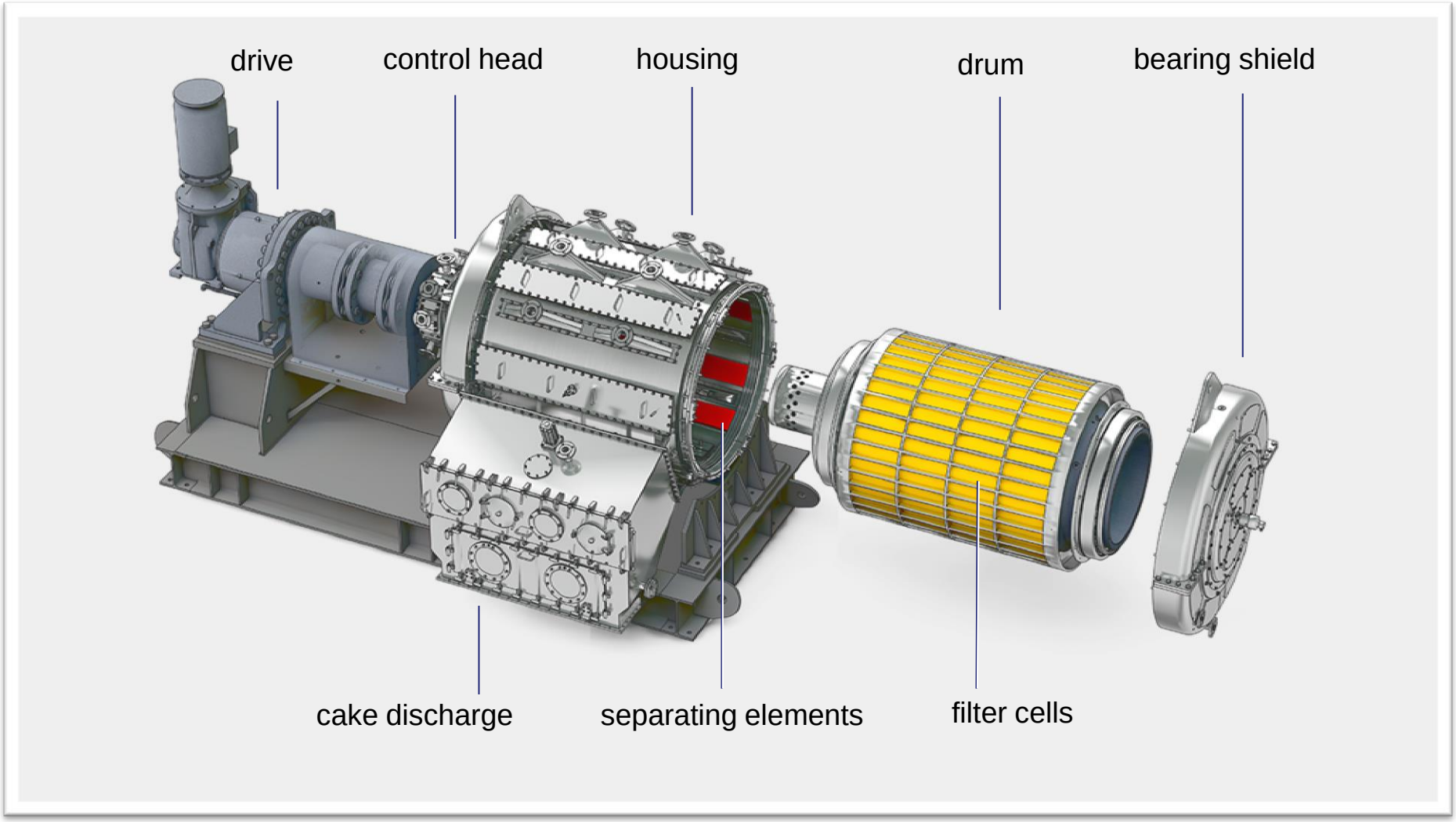
Air for Blowing for Cake Drying

BHS Lab Testing: Cake Structure

BHS Rotary Pressure Filter (RPF)

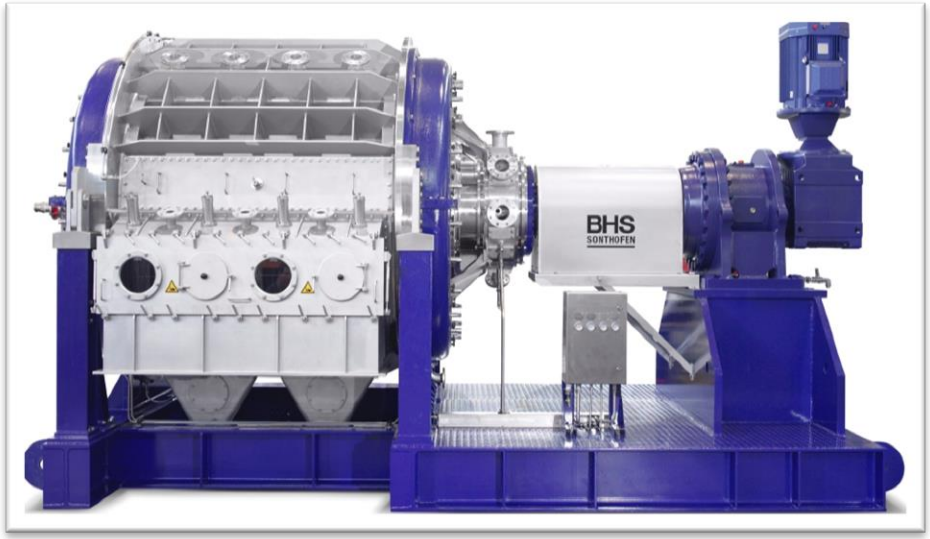


Main components



Functional principle

- “Three in one” machine: filtration, washing, drying
- Hydraulic (gas free) filtration and washing
- Multi step counter-current cake washing
- Completely enclosed process room
- Internal pressure release: cake discharge at ambient pressure



BHS rotary pressure filter with center drive

Machine design

For toxic or hazardous media:

- Second containment
- Closed bearing shields
- Leakage detection

Applications

Clean-In-Place Requirements

Avoiding of potential contamination by solid deposit:

- Cross contamination
- micro-bacterial contamination

Requirement:

- cGMP design and engineering of the installation
- Effective, efficient and reliable cleaning procedure.

Cleaning-in-place (CIP)

Fully or semi automated cleaning procedure without dismantling the system.

The five influencing factors:

- Velocity
- Temperature
- Chemicals
- Time
- Technology

CIP mechanism

- **Mechanical:**

  Removal of solids by impact with high pressure and turbulent flow.

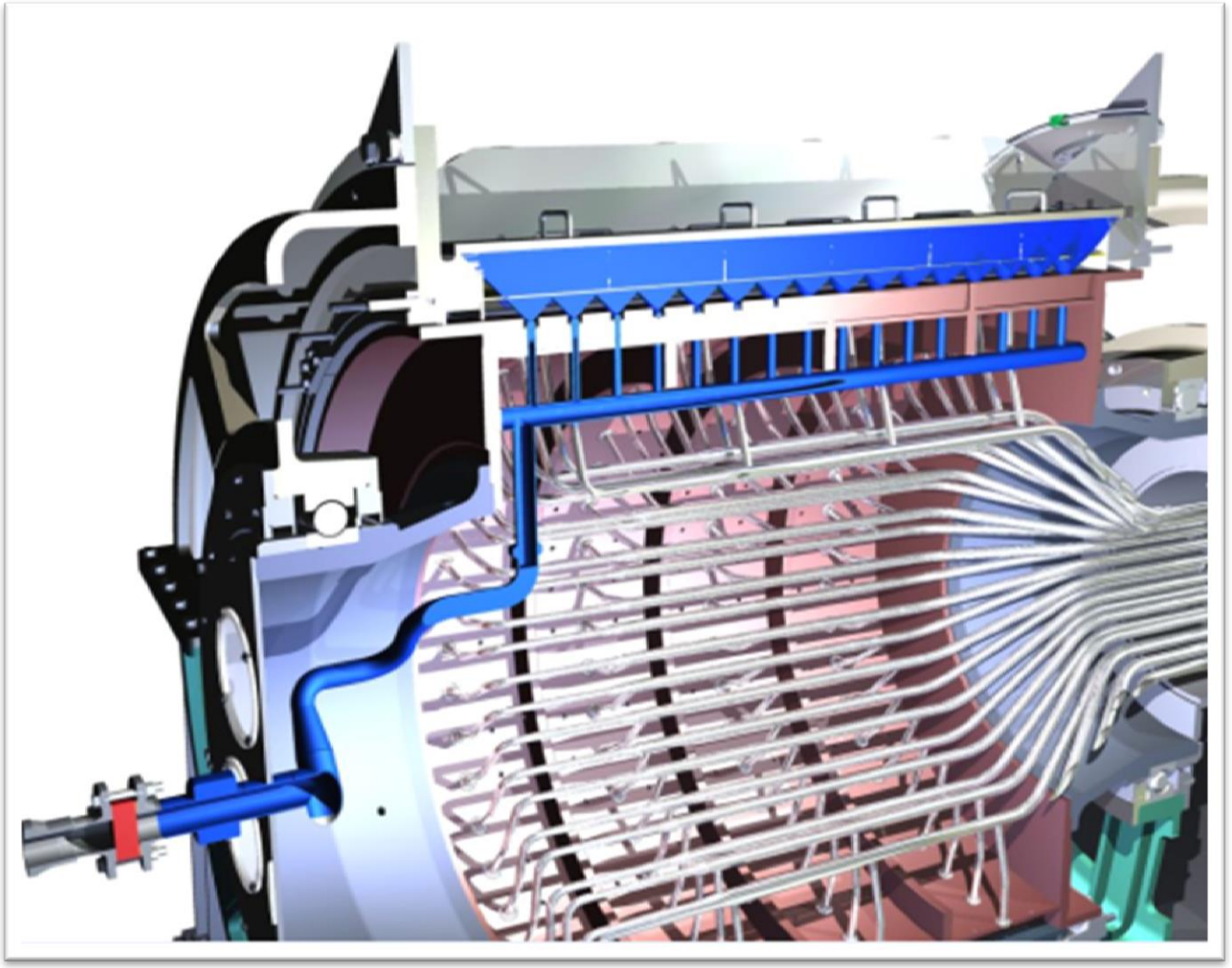
- **Chemical:**

  Removal of solids by chemical reaction with e.g. caustic soda and/or phosphoric and nitric acids

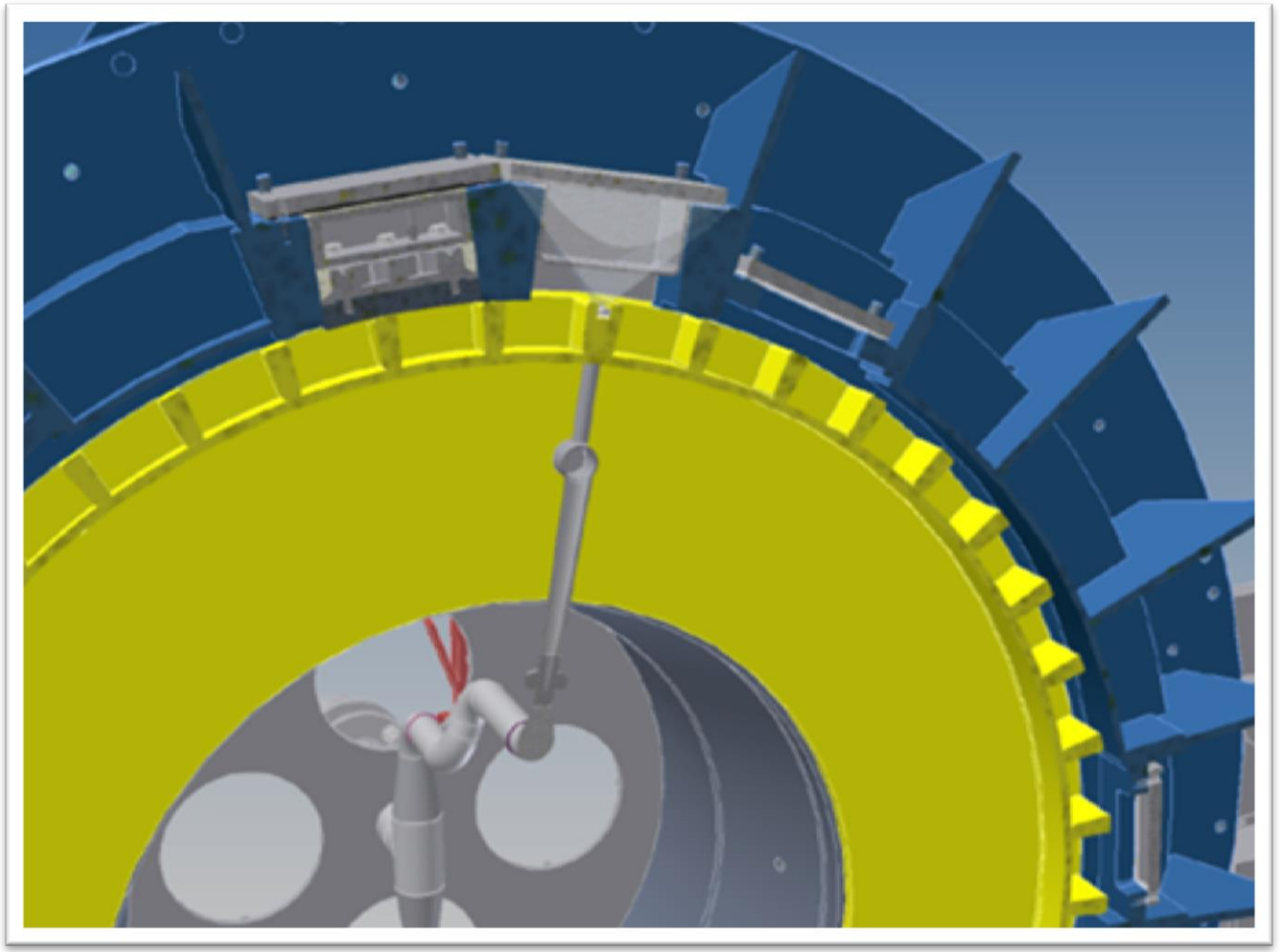
- **Sterilization:**

  Disinfection with e.g. sodium hypochlorite

Cleaning of the housing

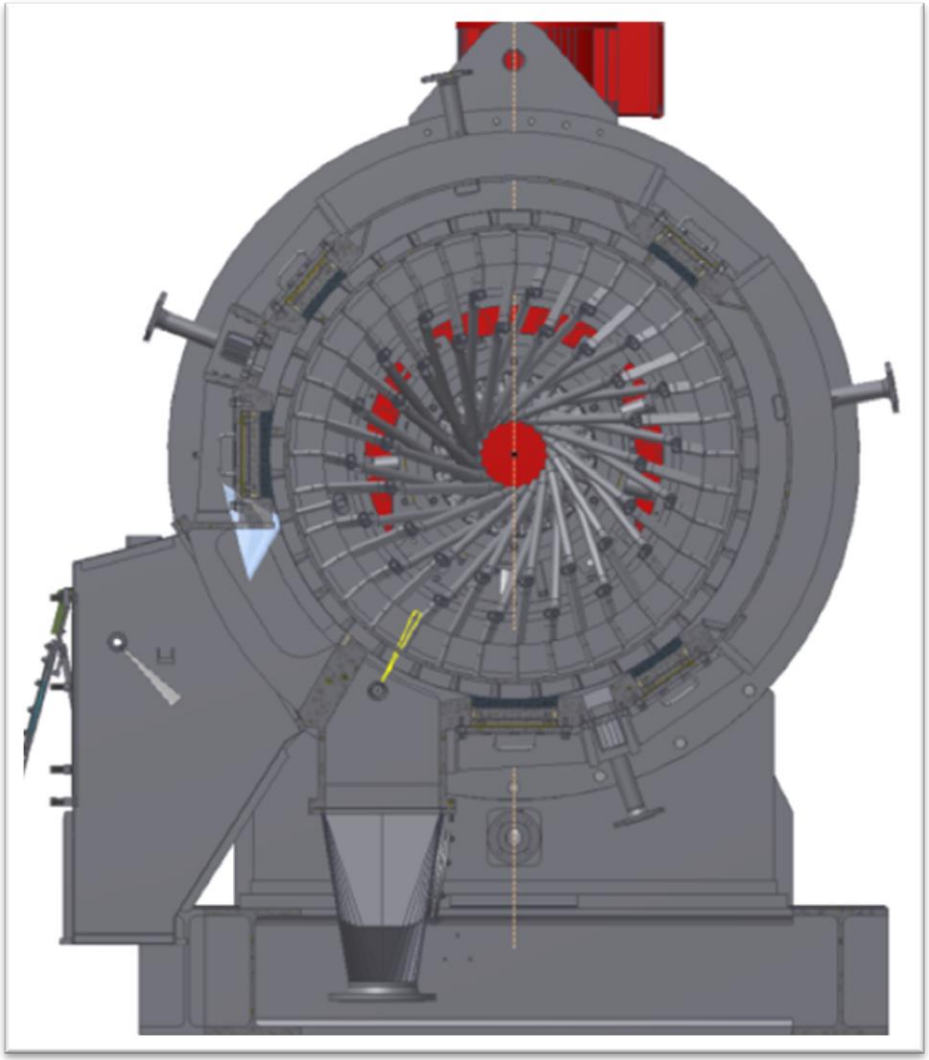


Hollow cone spray nozzles



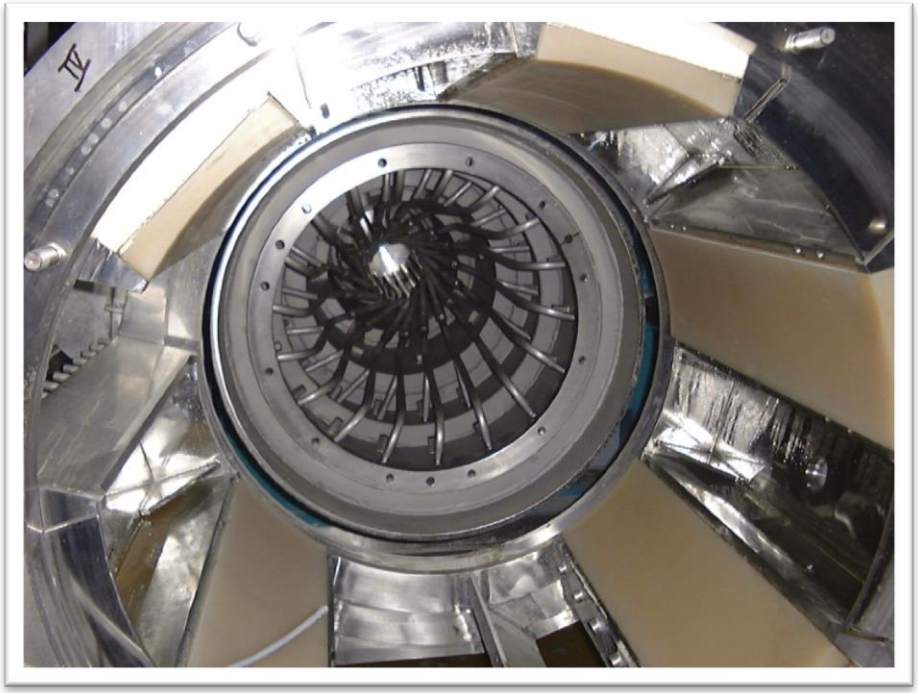
CIP devices

- Housing and inlets
- Drum and filter media
- Cake discharge chute

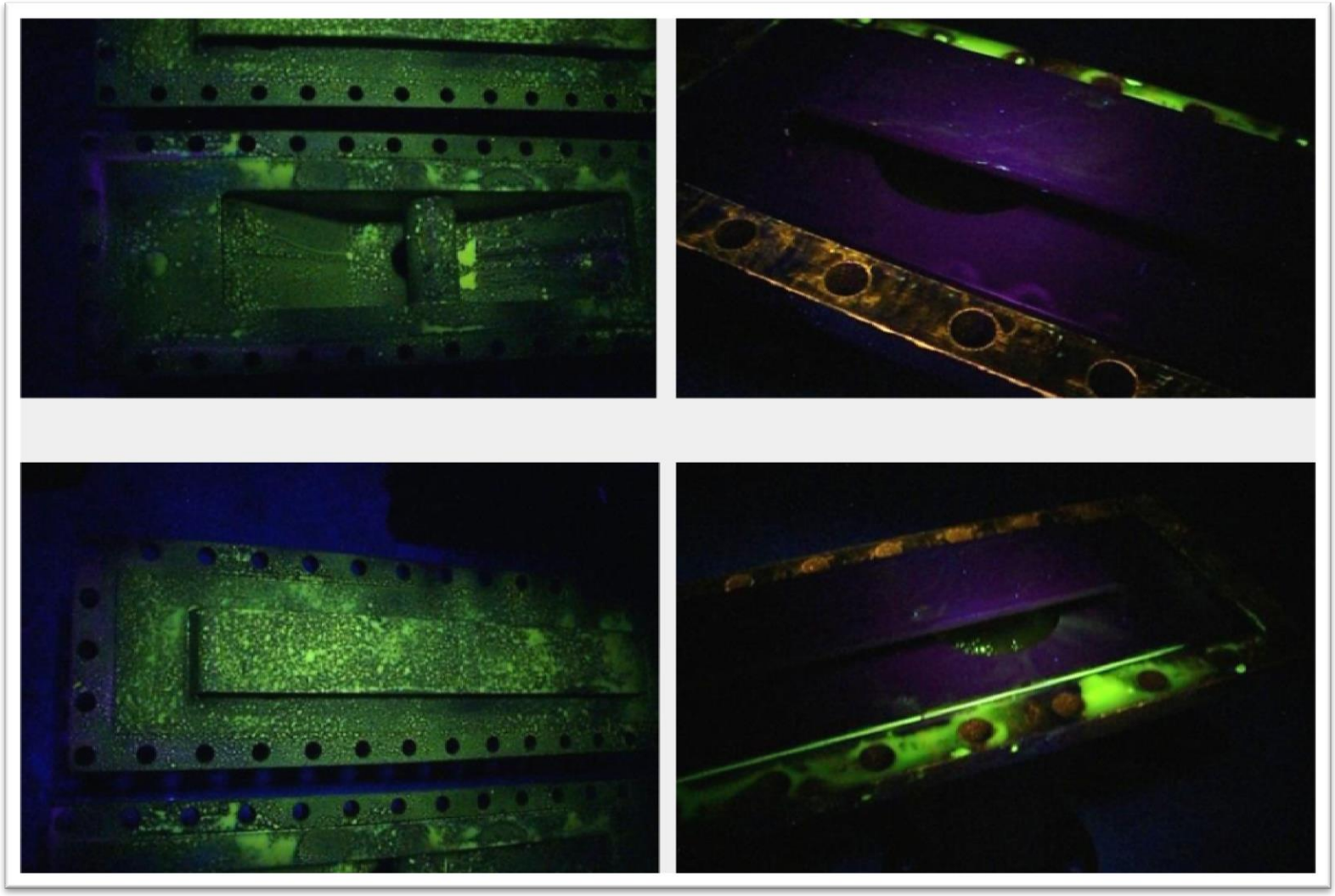


Design features

- Materials and surface roughness
- Good drainage philosophy (“self drain”)
- less gaps and dead ends



Riboflavin test



Example: CIP in Food Application

Process step	Time [min]	Washing agent	Recycling
Filter draining	3	-	-
Pre-rinse	3	water	no
Main cleaning 1	40	detergent	yes
Main cleaning 2	80	detergent	yes
Subsequent cleaning	20	water	yes
Final rinse	3	water	no

Example: CIP in Food Application

- Total rinsing consumption: approx. 4 m³
- Max. temperature rinsing liquid: 60°C
- Cleaning time: approx. 3 h
- Cleaning period: weekly
- Velocity filtrate pipes: approx. 2 m/s

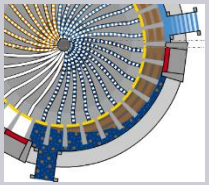
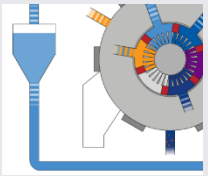
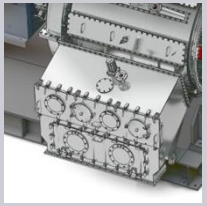
Pharma Applications

- 40 rotary pressure filters for active pharmaceutical products (API) within the last 15 years
- FDA approved sealing material
- ATEX rated machine design
- Safe and tight process
- High efficient multiple step cake washing and extraction

Success story – Pharma Application

- **Product:** antibiotics
- **Suspension:** app. 2 m³/h, solids in isopropanol
- **Filter area:** 2,16 m²
- **Cake thickness:** 12 mm
- **Production rate:** app. 130 kg/h incl. moisture
- **Process steps:** filtration, cake washing with water and isopropanol, dewatering with nitrogen

Highlights review

Hydraulic (gas free) filtration	
Counter current cake washing	
Cake discharge at ambient pressure, no lock system	
Fully automatic cleaning-in-place system	

Thank You!

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