

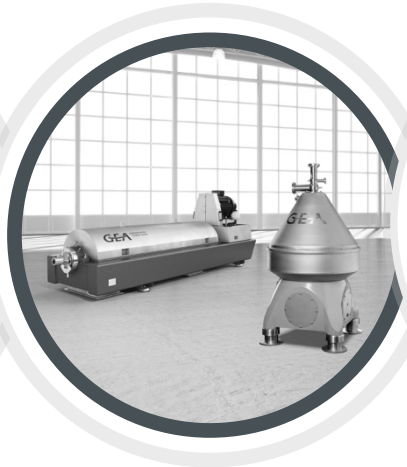
# Sustainable and economic tailing dewatering by decanter centrifuge

6<sup>TH</sup> JUNE/2019 IBRAM, BELO HORIZONTE





**About GEA**



**GEA Separation**



**Chemical**



**Tailing dewatering**



## About GEA

GEA is one of the largest technology suppliers for food processing and a wide range of other industries.



**18,642**  
employees (FTEs)



**4,828**  
EUR million revenue

The company is listed on the German MDAX (G1A, WKN 660 200), the STOXX® Europe 600 Index and selected MSCI Global Sustainability Indexes.



**4,918**  
EUR million order intake

The global group specializes in machinery, plants, as well as process technology and components. GEA provides sustainable solutions for sophisticated production processes in diverse end-user markets and offers a comprehensive service portfolio.



**518**  
EUR million operating  
EBITDA



**10.7**  
% operating  
EBITDA margin



**0.85**  
EUR per share  
dividend proposal

# LAM Cluster & Country Organizations

## LAM Cluster

👤 518  
€ 347 million  
% 100

## Mexico

👤 63  
€ 99 million  
% 27

## Colombia Cluster

👤 71  
€ 50 million  
% 14

## Peru Cluster

👤 11  
€ 13 million  
% 4

## Brazil

👤 257  
€ 114 million  
% 31

## Chile

👤 41  
€ 27 million  
% 8

## Argentina Cluster

👤 89  
€ 59 million  
% 16

📍 GEA locations  
(sales offices, service branch or other GEA sites)

👤 Employees in April 2019 (FTEs)

€ Revenue in 2018

% Country & Cluster revenue split in 2018





## GEA Brazil

GEA is present in Brazil since the 50's, providing locally world class equipment, solutions and services



- Operation sites: Jaguariúna and Campinas;
- Aprox. 300 employees, including teams:
  - ✓ Equipment specialists
  - ✓ Complete solutions, process definition, project managing and execution;
  - ✓ Service and spare-parts;
- Extense installed base in diferent applications and industries;

## Corrective & Preventive Maintenance

GEA's preventive maintenance programs keep plant and equipment operational and extend their working life.

- More than 20 people team dedicated to service our equipment;
- Up-to-date manufacturer know-how
- Same high level of care, precision and responsibility as GEA manufacturing
- Optimally maintained machines
- Maximum operation/production reliability

## Spare Parts

Original spare parts from GEA provide reliability and protect your investment.

- Optimized location of logistic hub
- Local stock with more than 150 000 parts categorized in more than 9 000 items
- Our high quality spare parts keep you up and running at maximum efficiency
- Our original parts are manufactured under high standards and are warranted;
- In addition, customized pre-analysis of the critical spare parts, short delivery times and constant availability guarantee safe and reliable operation of your equipment at all times





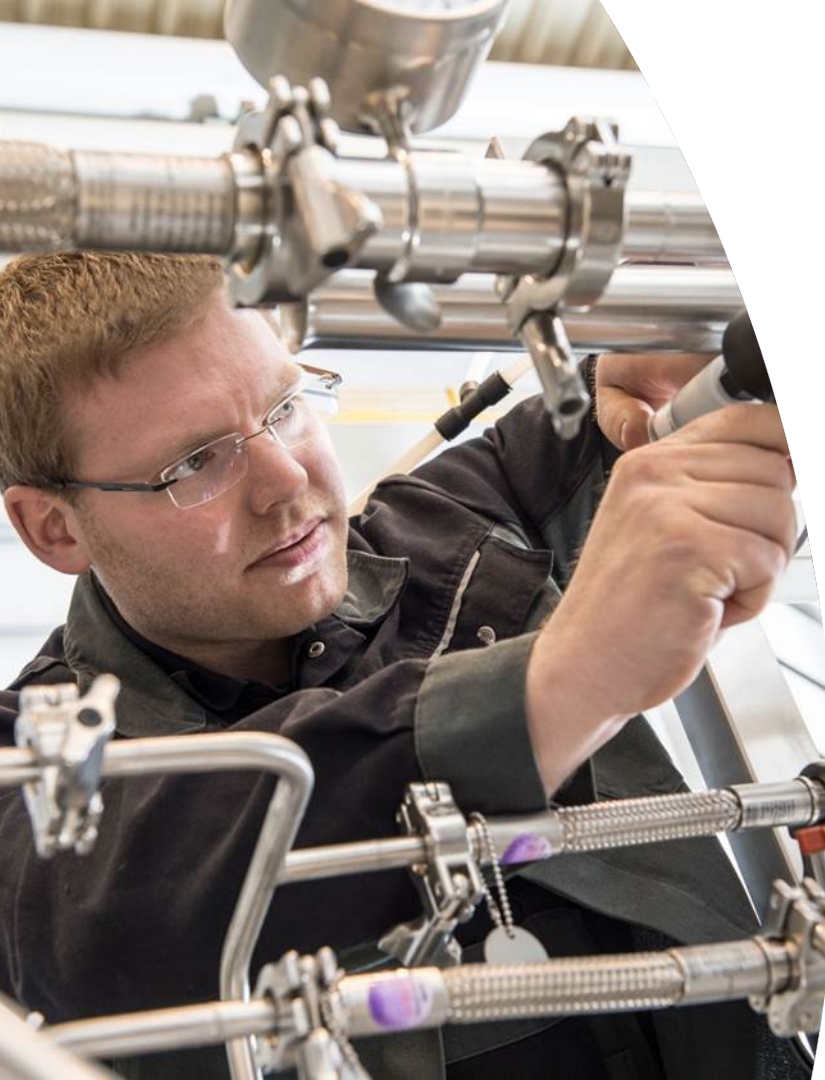
## Factory-Repair Center

Factory-repair equipment from GEA is efficient, reliable and quickly in place, with many years of serviceable life still ahead.

We have the knowledge to warranty their efficiency and safety, because we build them.

- Graduate Repair Center certification issued by GEA – HQ
- High standard equipment and tools;
- Extended lifetime of equipment;
- Know-how of the manufacturer
- Safety, quality, performance and warranty





## Other Value Added Service

- Comissioning & start-up
- Preventive inspection and recomendations
- Process and safety audits
- SLAs (Service Level agreements)
- Service projects
- Trainings
- Support and emergency Call Center



## GEA Separation

# Comprehensive testing – process development

**GEA Equipment offers a versatile range of test centrifugation services. After each test the client receives a detailed report, quantifying the technical and economic benefits of the GEA solution.**



## Enquiry

- GEA questionnaire
- Process information
- Database with 2500 products and 10,000 test reports



## Lab test

- GEA lab report
- Massbalance
- Budget CAPEX, (OPEX, TCO)



## Pilot test

- GEA pilot report
- Massbalance, process warranty
- Binding CAPEX, OPEX, TCO

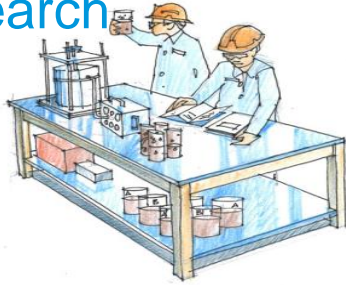


## Production scale

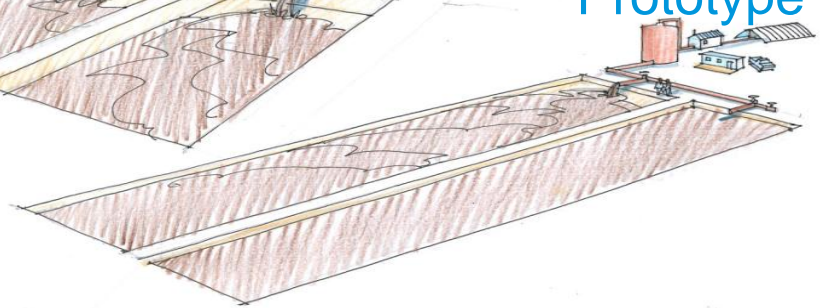
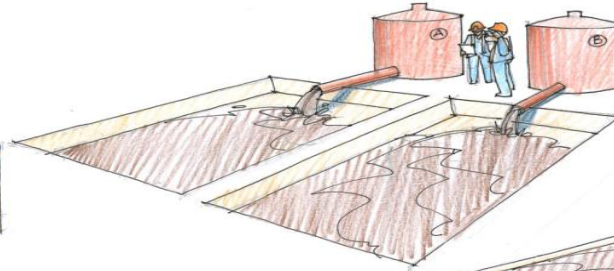
- GEA start up support
- GEA life cycle services
- Global network of competent test engineers

# Partnership of process development for tailing dewatering

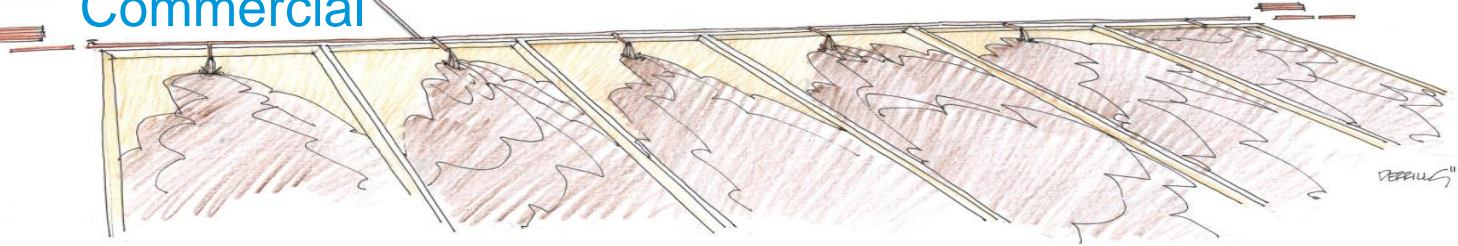
Research



Development  
Pilot  
Prototype



Commercial





## Chemical

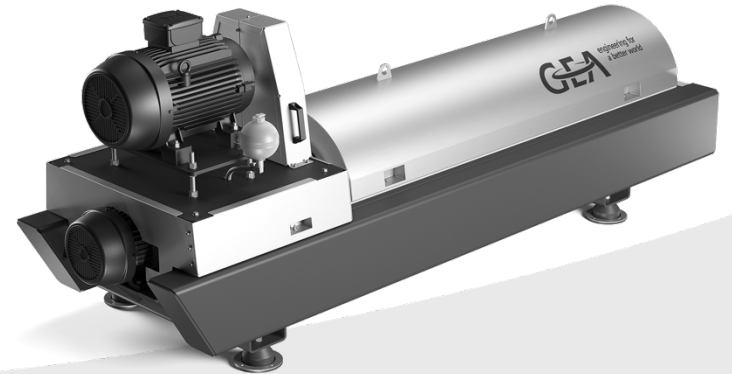
- **Sedimentation Centrifuges**
- Distillation
- Evaporation
- Solution Crystallization
- Freeze Concentration
- Spray Drying
- Fluid Bed Drying
- Flash Drying
- Calcining & Conditioning
- Ejector Technology
- Vacuum Technology
- Membrane Filtration
- Refrigeration



# GEA Centrifuges

In **1893**, the first centrifuge was built in Oelde – since then, progress in mechanical separation technology has been determined here.

The **disc stack centrifuges**, **decanter** and **process lines** have proven themselves worldwide in high-performance companies of all types and sizes under extreme operating conditions.





## Separation by Density Difference – Stokes' Law

$$V_g = \frac{d^2 (\rho_p - \rho_f)}{18 \eta} g$$

$V_g$  = gravitational settling velocity [m/s]

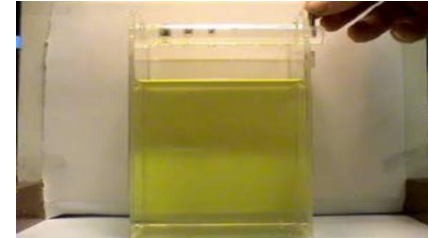
$d$  = particle diameter [m]

$\rho_p$  = particle density [kg/m<sup>3</sup>]

$\rho_f$  = fluid density [kg/m<sup>3</sup>]

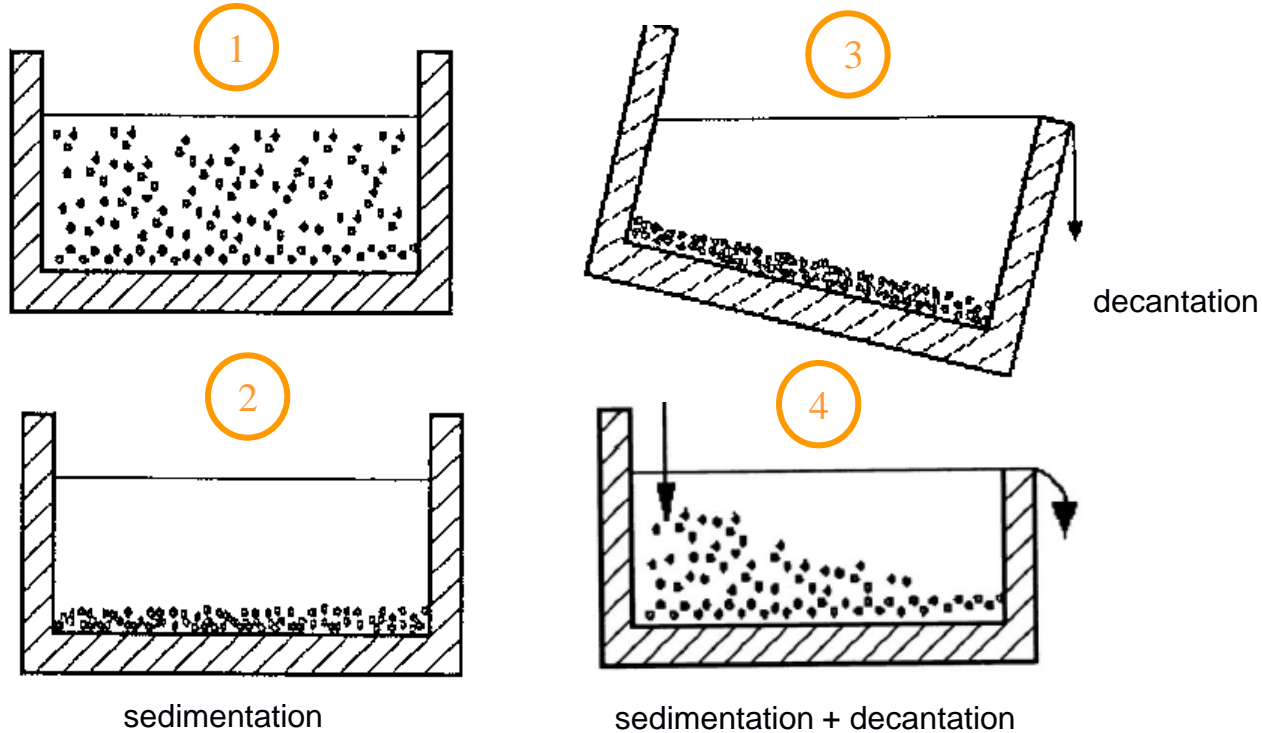
$\eta$  = fluid dynamic viscosity [kg/m\*s]

$g$  = gravitational acceleration [9,81 m/s<sup>2</sup>]



# Principle of liquid solid separation using decanter centrifuge

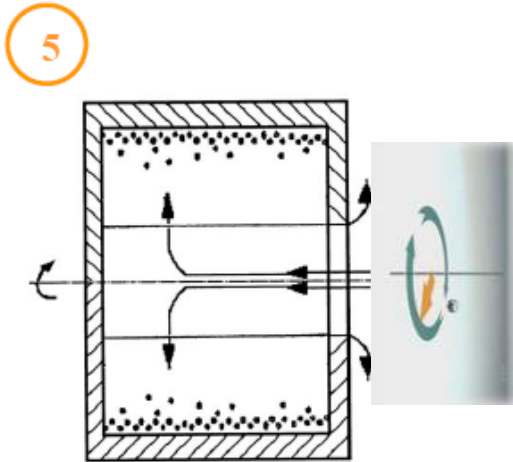
A decanter centrifuge performs continuous for sedimentation and decantation.



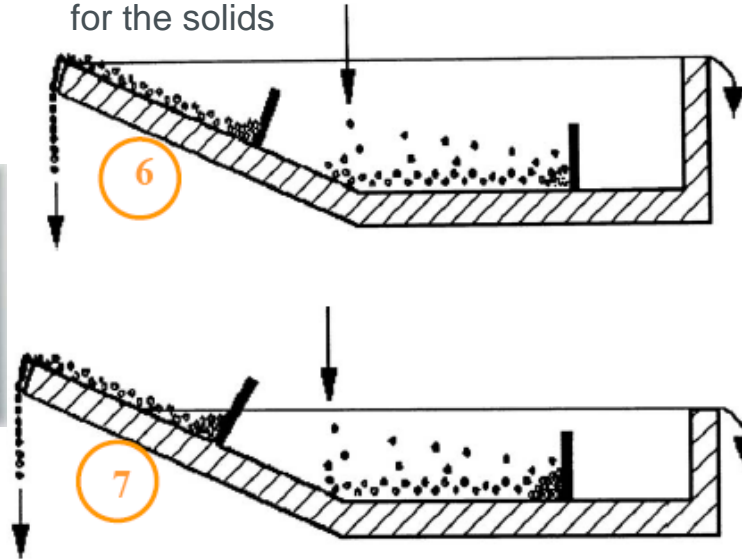
# Principle of liquid solid separation using decanter centrifuge

**A decanter centrifuge performs continuous sedimentation and decantation, under G-Force, Conveying solids and dewater solids.**

Improvement by using centrifugal force



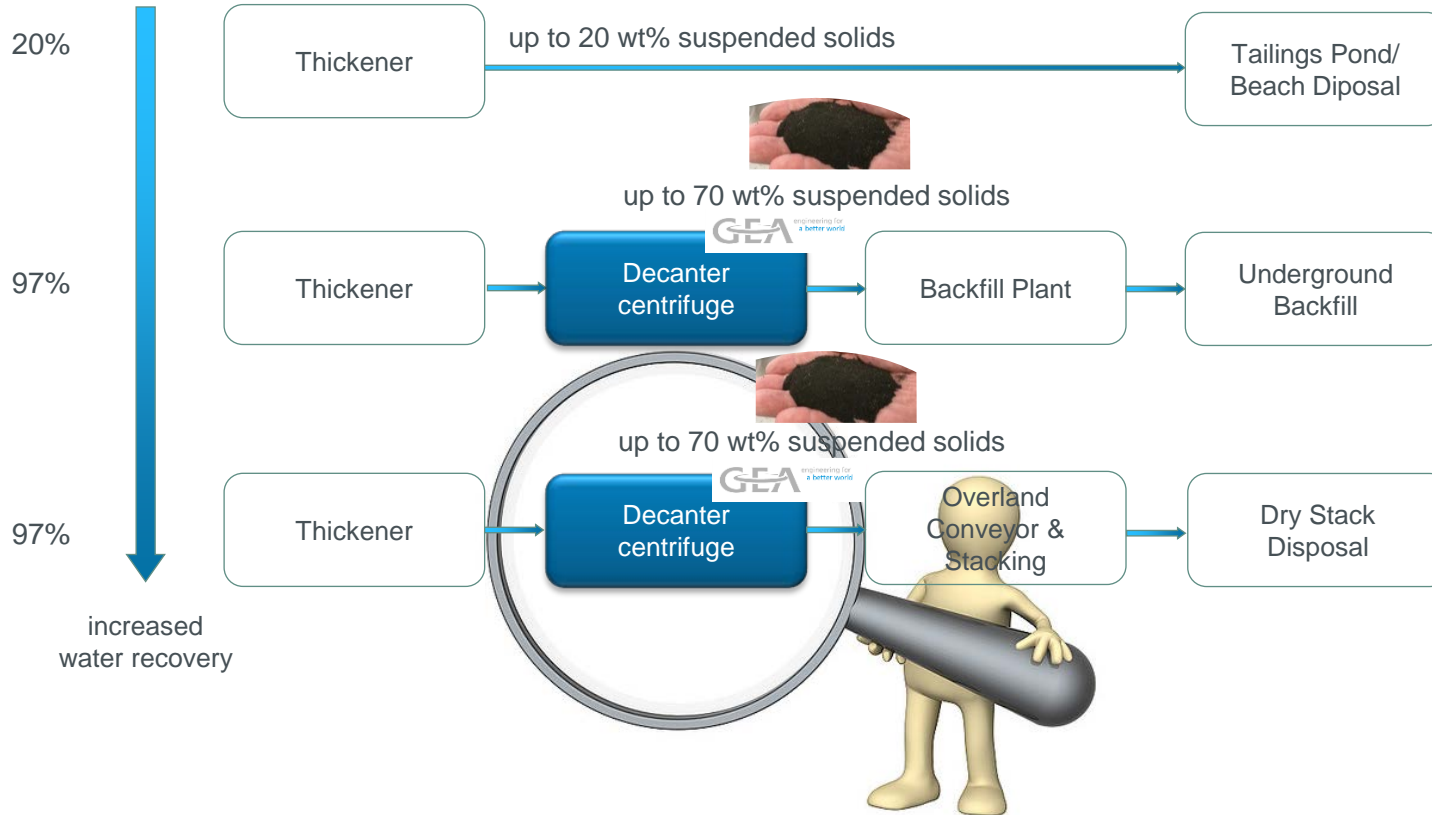
Improvement by using conveying device for solids discharge and dewatering zone for the solids



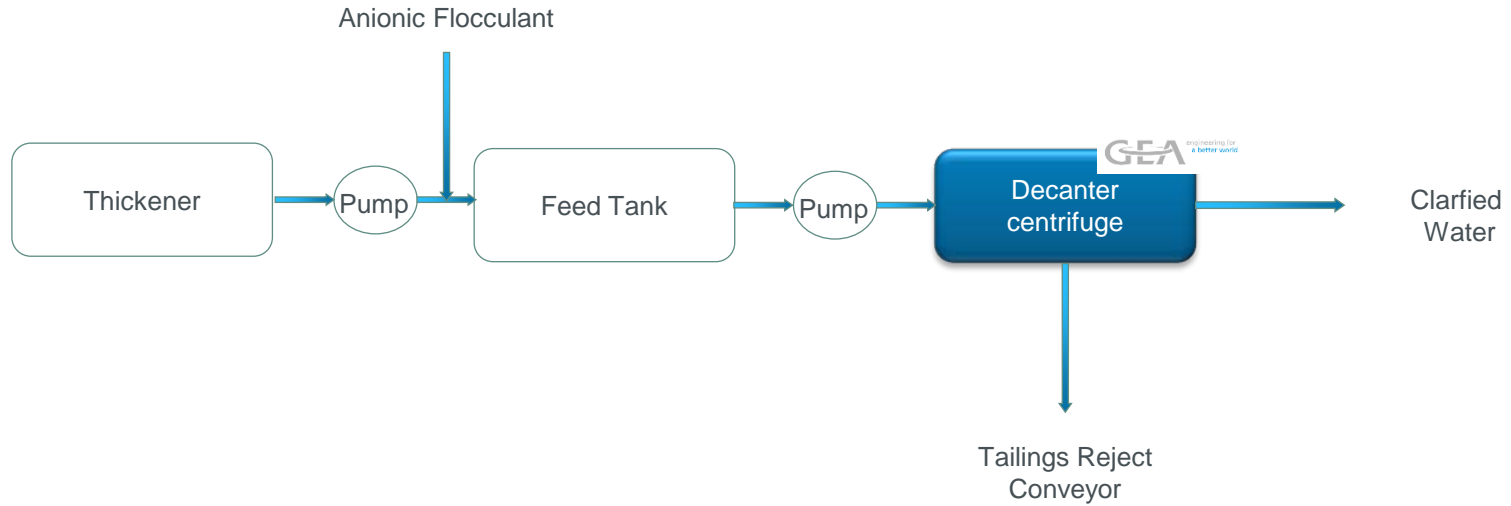


**Tailing dewatering**

# Tailing Processing



# PFD Tailing Processing



# Benefits for our customer

This simple yet unique combination of existing, robust technologies can deliver a solution with more attractive product characteristics to much more easier solid handling for our customers





engineering for  
a better world

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