Efficient and secure:
Vaccine Production with GEA pharma separators

DCVMN ANNUAL GENERAL MEETING
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DIRECTOR BUSINESS LINE CHEMICAL & PHARMA
GEA – engineering for a better world

GEA is one of the largest technology suppliers for food processing and related industries.

The company is listed on the German MDAX (G1A, WKN 660 200), DAX 50 ESG, the STOXX® Europe 600 Index and selected MSCI Global Sustainability Indexes.

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
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<tbody>
<tr>
<td>Employees (FTEs)</td>
<td>18,490</td>
</tr>
<tr>
<td>Revenue (EUR million)</td>
<td>4,880</td>
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<tr>
<td>Order intake (EUR million)</td>
<td>4,931</td>
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<tr>
<td>EBITDA before restructuring</td>
<td>479</td>
</tr>
<tr>
<td>Dividend proposal</td>
<td>0.85 EUR per share</td>
</tr>
<tr>
<td>(EBITDA before restructuring)</td>
<td>9.8%</td>
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Fiscal year 2019
Local presence worldwide

GEA locations
(sales offices, service branch or other GEA sites)
GEA serves the entire vaccine process.
Separation solutions in human vaccines

**Non-Live vaccines**
- Influenza
- Cholera
- Bubonic plague
- Hepatitis A or hepatitis B
- Whooping cough (pertussis)
- Tetanus
- Diphtheria
- Pneumococcal bug

**Live vaccines**
- Measles
- Mumps
- Rubella
- Yellow fever
- Chickenpox
- BCG (= tuberculosis vaccine)
- Typhus
- Human rotaviruses
- Whooping cough (pertussis)

**Culture media**
- Valuable phase
- Waste
GEA separation solutions in human vaccines
Unique: GEA Pharma test bay for pre-qualification

Pre-qualification of separator centrifuge skids

Flexibly and safely on the GEA pharma test bay.
Maximum yield thanks to high precision desludging

GEA self-desludging centrifuges

Typical feed conditions in vaccine productions:
3-5 % solids in volume, depending on vaccine
30 -1000 l/h, up to 7000 l/h possible for larger machines
Gentle product handling, higher viability of cells, more efficient clearification

Hydrohermetic Feed patented by GEA Westfalia Separator Group

Common Feed
Product accelerated freely

Hydrohermetic Feed –
Product accelerated within the liquid, underneath the disk
Cleanability – CIP and SIP

Total bowl ejections – possible with hydrohermetic feed system
Cleanability – CIP and SIP

Total bowl ejections – possible with hydrohermetic feed system

Spray Nozzles
Cleanability – CIP and SIP

Total bowl ejections – possible with hydrohermetic feed system

Spray Nozzles

Steam Sterilization
The next level of pharmaceutical cleanability: Patented gap-free welded disc spacers

GEA’s patented laser-welded disk spacers lead you to the next level of pharmaceutical cleanability.

Perfectly clean: High quality laser-welded spacers
Maximum welding precision leaves no dead spaces in the disk stack, providing the basis for a highly effective CIP and SIP cleaning.

Optionally available for GEA pharma separator pure.
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Reference Customers Human Vaccines

Until 2019

50 customers

Sold 160 package units
I am happy to answer your questions:

Dr. Markus Kuehberger
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