

Pharmaceuticals Production Needs Steam –how to Perform the Transition to Green Energy?

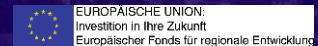
Dr. Werner Sievers
Sanofi-Aventis Deutschland GmbH
May 13 2022



**Process⁴
Sustainability**

**Cluster for climate-neutral
process industries in Hesse**

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EUROPAISCHE UNION:
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Our 5 environmental commitments

 **Fight climate change: chase after carbon neutrality by 2030 and net zero emissions by 2050**

By engaging Sanofi towards the 1,5°C global warming trajectory

 **Limit our environmental footprint and aim for circular solutions**

By optimizing the use/reuse of resources and reducing impact of emissions

 **Improve environmental profile of products**

By delivering eco-innovative products and fostering a sustainable use of medicines

 **Mobilize our people for environmental sustainability**

By promoting an environmentally-conscious culture in the workplace

 **Engage our suppliers in our environmental ambitions**

By sourcing responsibly and leading by example

Pharmaceuticals Production Needs Steam

- 1 ● Introduction
- 2 Chemical API 's
- 3 Biological API 's
- 4 Summary



Pharmaceuticals Production Needs Steam – how to Perform the Transition to Green Energy?

- Production of active pharmaceutical ingredients are based on chemical and biotechnological processes.
- The chemical reaction and the bio fermentation have lots of steps around
- Almost all of the technical assets like reactor, fermenter, etc need heating energy, which is today provided by steam.
- Biotec operations need huge amounts of steam for sanitization and sterilization
- how to replace a central steam unit and / or to replace individually on each point of use the heating unit by renewable energy assets?
- *under all well known restrictions of time pressure, financial budget and compliance*

Pharmaceuticals Production Needs Steam – how to Perform the Transition to Green Energy?

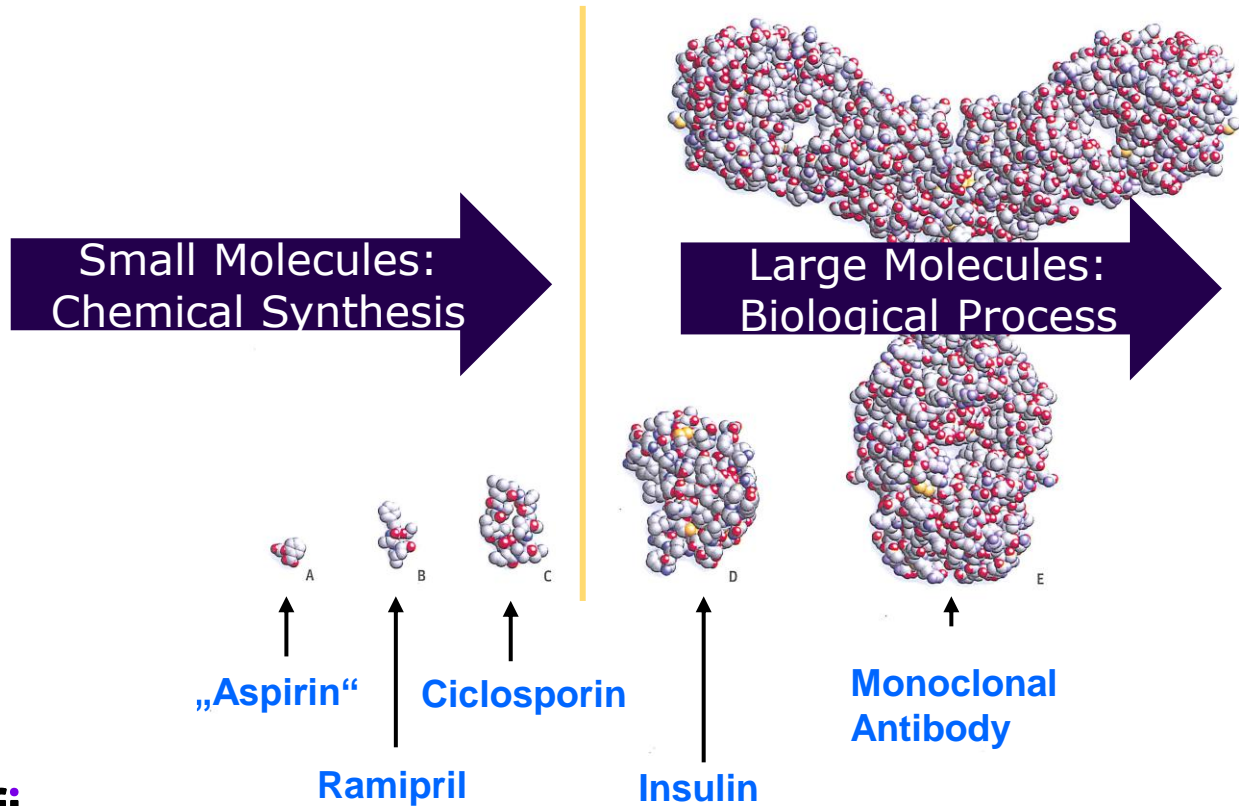
Today ´s quick recommendations for replacement of steam:

- Use renewable electricity ...
- Use heat pump ...
- Use hydrogen ...
- Use biogas ...
-

SANOFI in Industrial Park Frankfurt-Höchst



Active Pharmaceutical Ingredients [API]

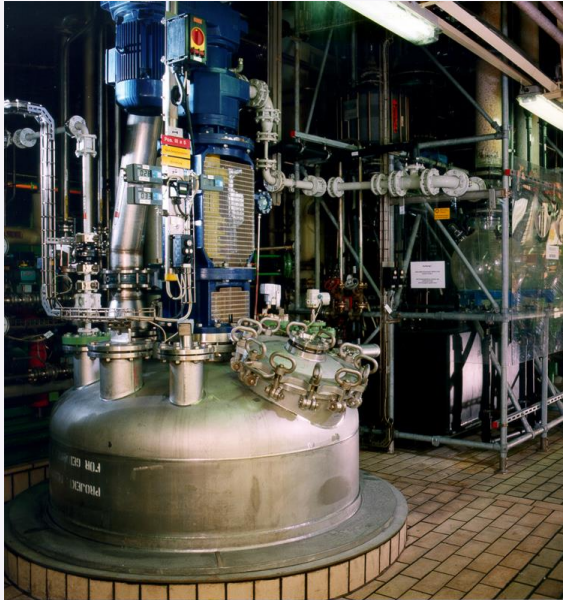


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Need for Steam in Chemical API Production [1/3]

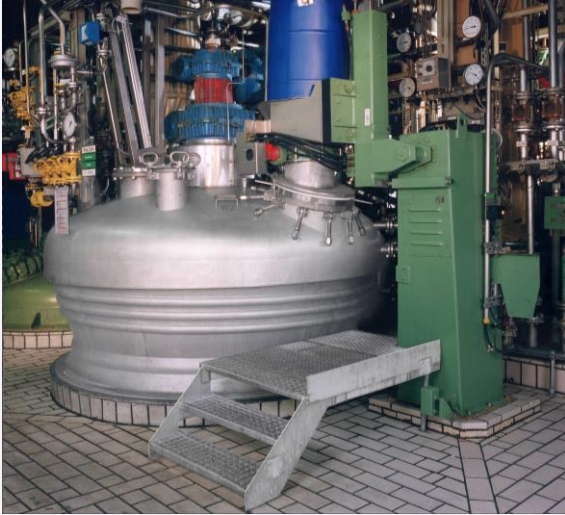


Reactor



Vessel for Crystallisation

Need for Steam in Chemical API Production [2/3]



Dryer
(Conical and Agitated)

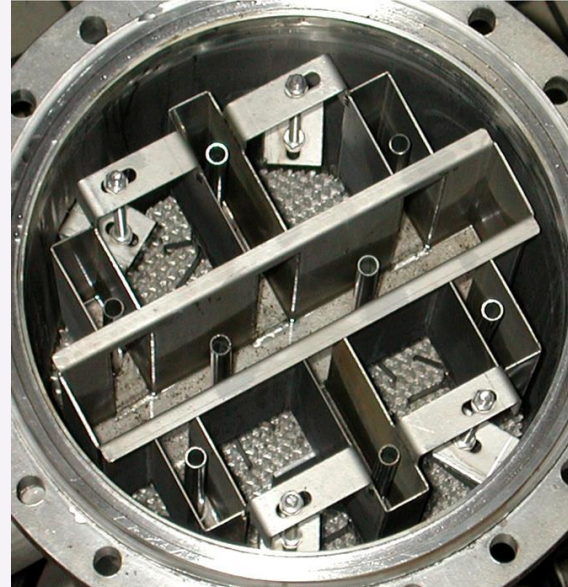


Dryer
(Drying Oven)

Need for Steam in Chemical API Production [3/3]



Distillation [Rectification]



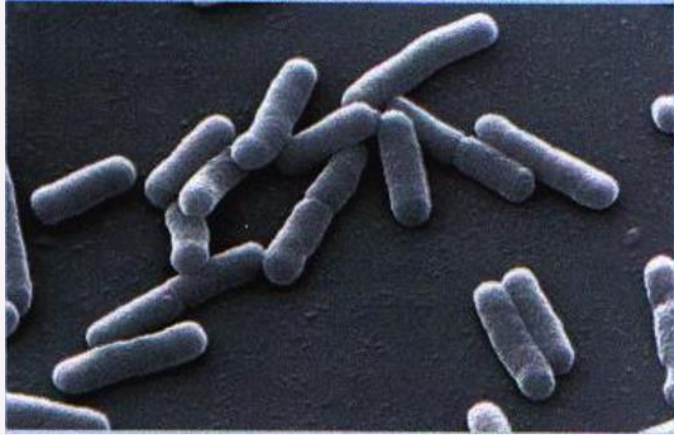
Inside Distillation:
Structured Packaging

Pharmaceuticals Production Needs Steam

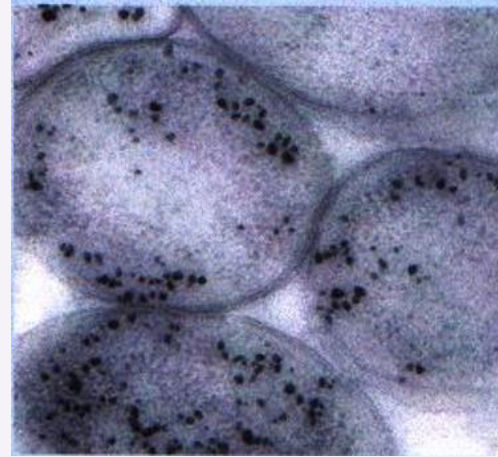
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Microorganisms: Bacteria and Mammalian Cell Culture



Bacteria [E. coli]



Mammalian Cell Culture
[CHO]

Need for Steam in Biotechnological API Production



Large Scale Fermenter



Construction

Sanitization and Sterilisation

Extraordinary Situation in Biologics Production: **STERILE CONDITION**

How to perform Sterilization: Steam to heat all assets above 120 °C

Need for huge amounts of steam!!



HVAC [Clean Room, Laboratory, Storage, ...]

Heating
Air Conditioning

→ Temperature
→ Humidity



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Pharmaceuticals Production Needs Steam – how to Perform the Transition to Green Energy?

- Pharmaceuticals are “small volume products” – but need the full set of process operations as in chemical and/or biotechnological process industries
- Almost each and every technical item was and is build to use steam as process medium
- When building up a greenfield factory, the direct use of electrical heating instead of steam seems to be a promising strategy, including heat pump technology
- Operating existing and established process technologies, steam is needed and cannot be easily replaced
- Transition to renewable energy: the steam generation (today mostly done by gas/oil/coal) must be replaced by renewable energies

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Thank you
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