

LIT Breakfast briefing

How smart actuators can help solve societal challenges

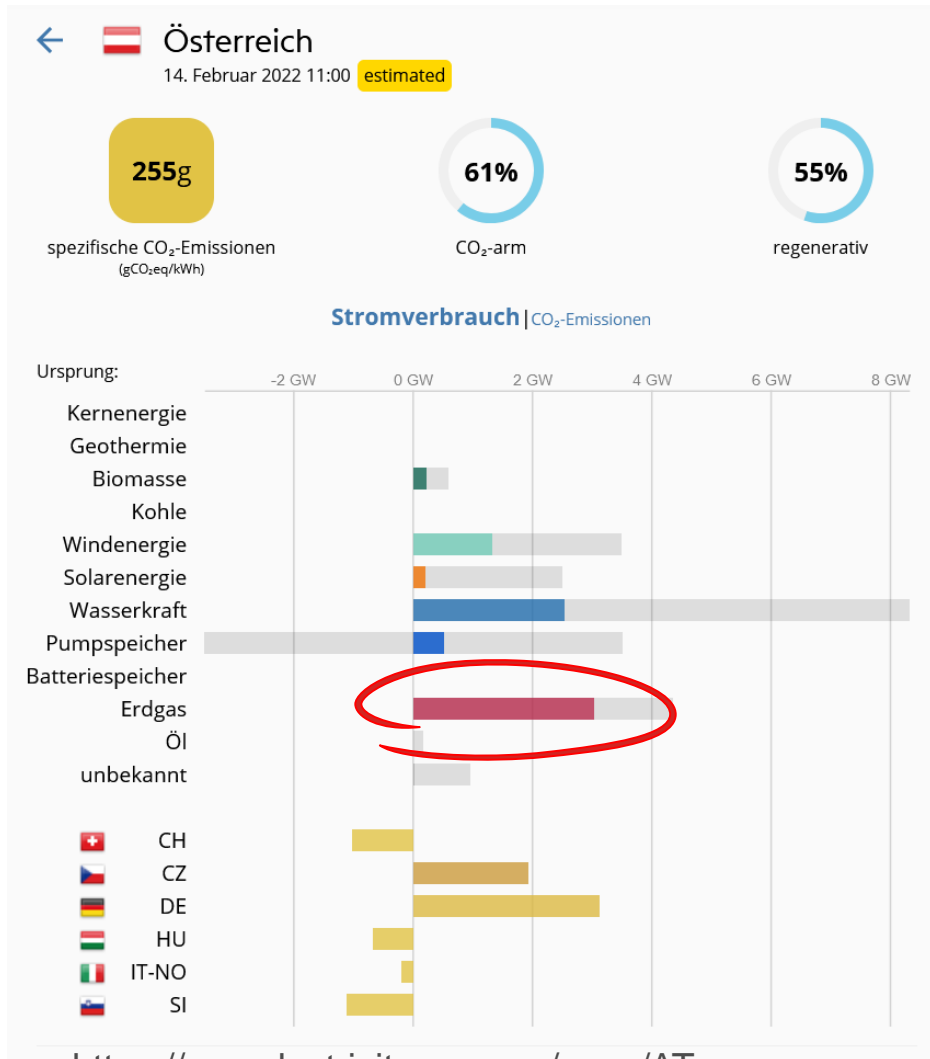
Feb 15th, 2022,
Florian Poltschak



*JKU HOERBIGER Research Institute for Smart Actuators
– Established by the HOERBIGER Foundation, Zug, Switzerland*



Technical challenges of societal challenges



Gas compression

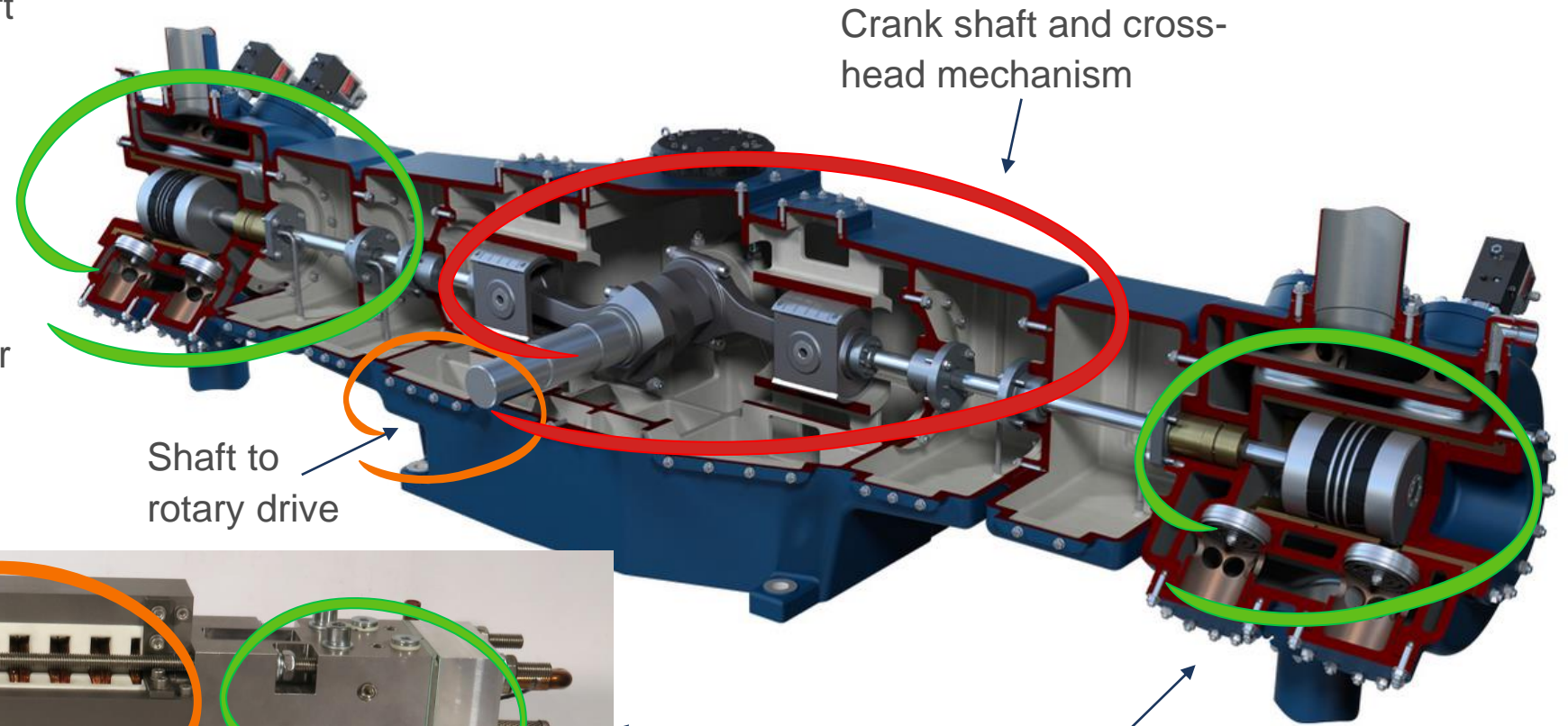
- **Efficient use of energy**
- **Hermetic systems:** Minimize leakage of green-house gases
- **Safety**
- **Robustness**
- **Low-maintenance systems**
- **Efficient controllability**

→ Smart actuators for efficient compression (control)

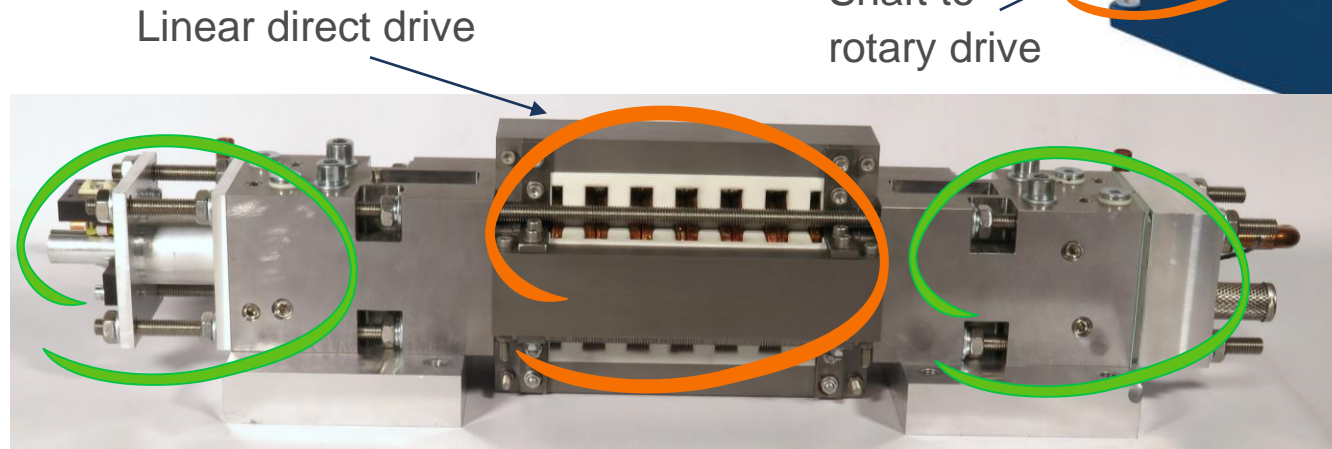
<https://app.electricitymap.org/zone/AT>

Smart actuation in compression technology

Piston compressor with crank shaft
(e-motor not shown)



Direct drive free piston compressor
(small sized lab prototype)



Shaft to rotary drive

piston

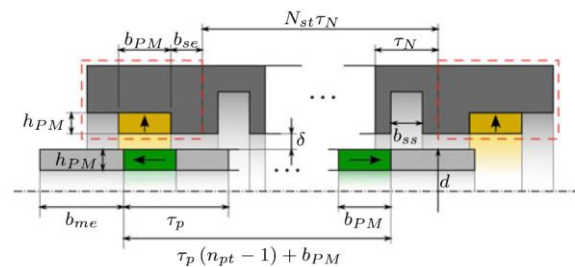
Smart actuation in compression technology

Hermetically closed free piston compression



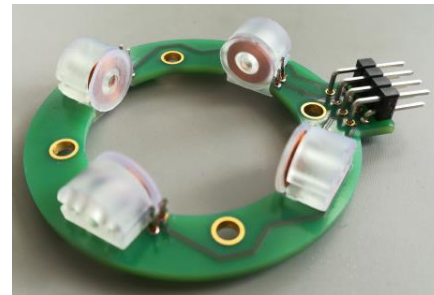
Magnetic springs

- compensate for inertia forces
- act contactless and allow encapsulation of piston rod
- completely passive system



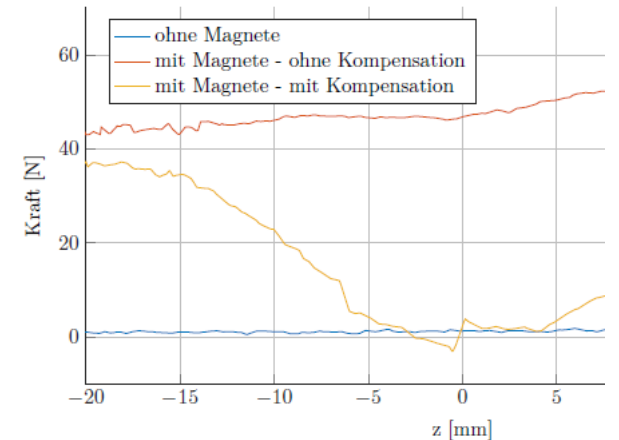
5 axis sensor system

- position of the piston rod in 5 axis
- fully integrate contactless solution

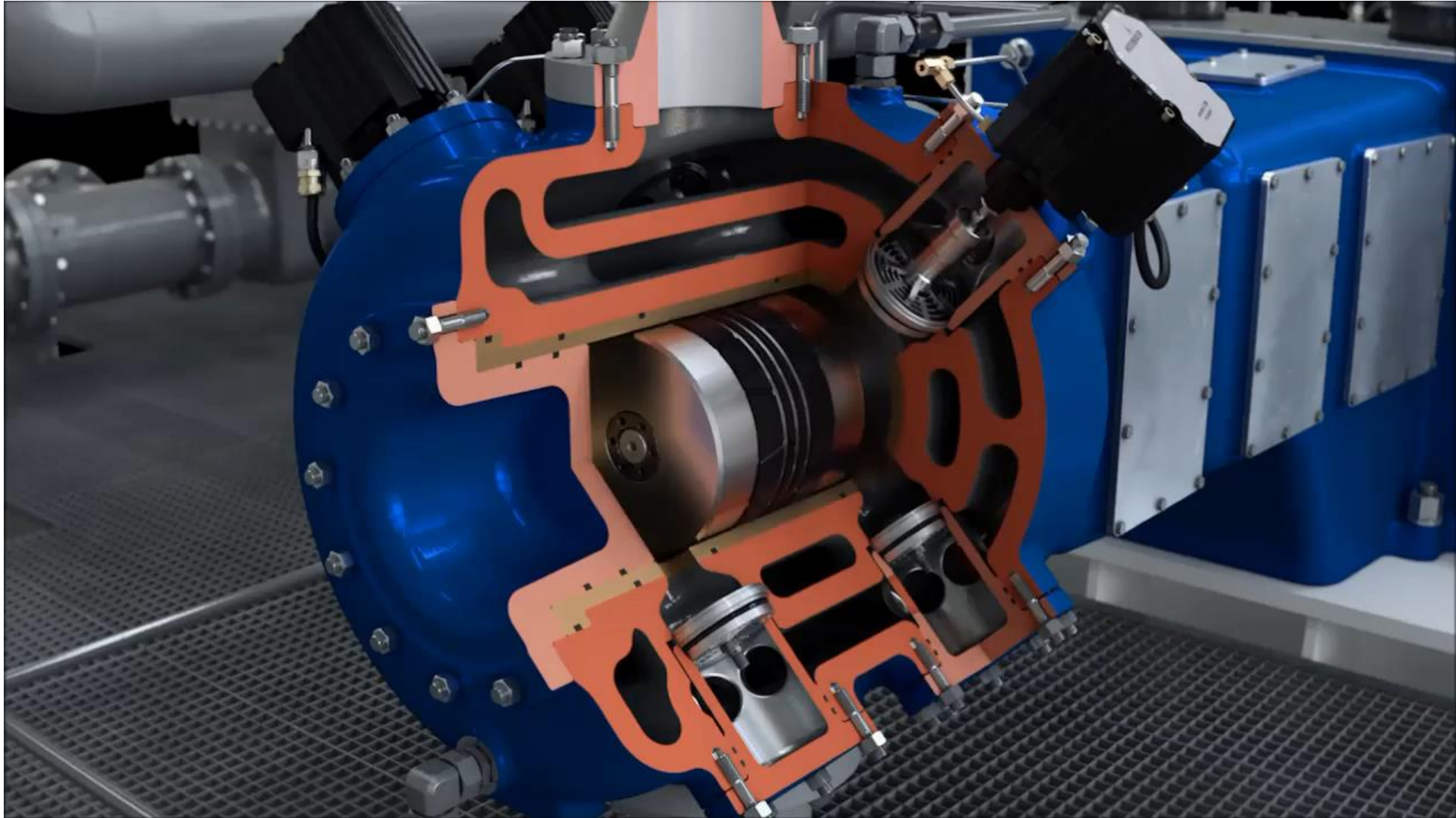


Reduction of bearing forces

- coil excitation controlled to minimize bearing forces and reduce losses
- break even point of system efficiency is found at 14Hz



Smart actuator for efficient supply rate control



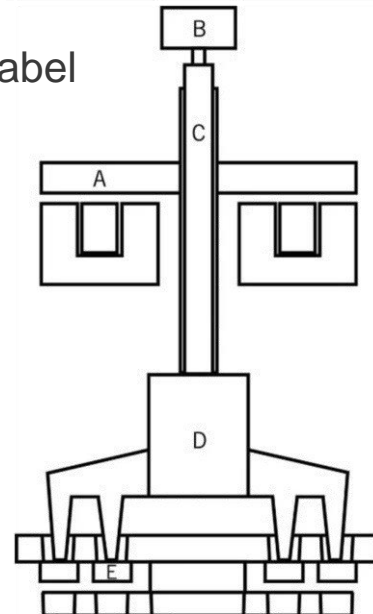
Smart actuator for efficient supply rate control

eHydroCom



Hybrid actuator

- High performance solenoid
- Spindle drive to adjust stroke
- Retrofittabel



Thermal management

- Completely closed system
- Passive cooling
- Integrated loss management
- Optimal operation point control
- Certified explosion protection

Advanced Control

- Soft landing
- Active wear compensation
- Thermal expansion compensation
- Iterative learning for stable operation



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