

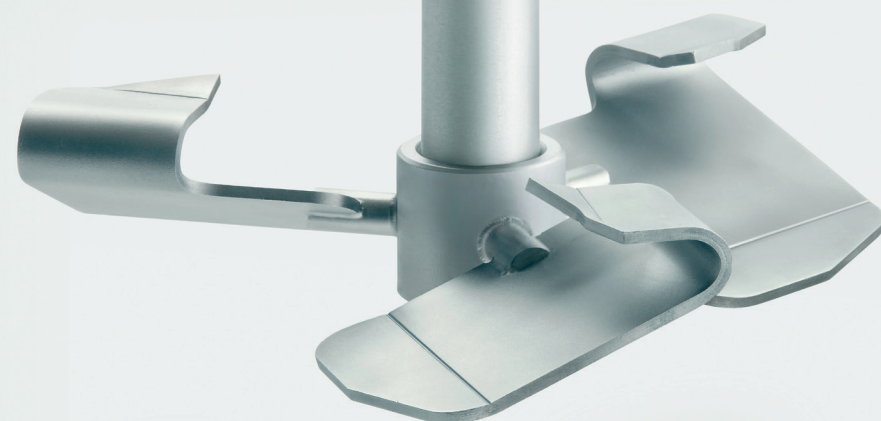
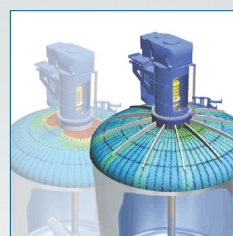
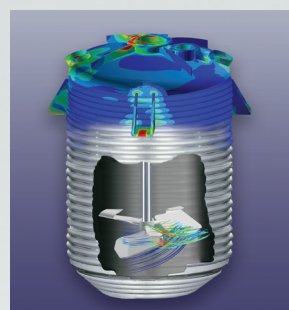
More than 250,000 EKATO agitators are now in use in diverse industrial branches worldwide. EKATO offers a complete scope of services to optimize stirred reactors in the business segment "Engineered Solutions".

EKATO  
Rühr- und Misch-  
technik GmbH

Hohe-Flum-Str. 37  
79650 Schopfheim  
Germany

Tel. +49 (0) 7622 29-0  
Fax +49 (0) 7622 29-213  
E-mail: [info@ekato.com](mailto:info@ekato.com)

# Reactor- Engineering



**EKATO**

- Process Analysis
- Advanced Simulation  
and Calculation Methods
- Scale-up to Production Size



## EKATO Engineering Services

EKATO offers a comprehensive service package to increase the safety of plant equipment. Plant reliability as well as operational safety of vessels and internals can be decisively improved with the use of finite element analysis (FEA) and numerical flow calculations (CFD). Potential problems can be predicted in advance and avoided by analyzing the deformations, stresses and natural frequencies.

EKATO has been developing and optimizing mixing processes for more than 80 years and has delivered more than 250,000 agitators for use in diverse industrial branches worldwide.

[www.ekato.com](http://www.ekato.com)

### Requirements for a safe design of agitated vessels:

- Precise knowledge of the agitator loads acting on the vessel (type, direction, quantity, character)
- Knowledge of the direct and indirect excitation frequencies
- Efficient design software and experienced engineers with a sound knowledge of machine dynamics and material science

### Mechanical integrity of vessels and internals:

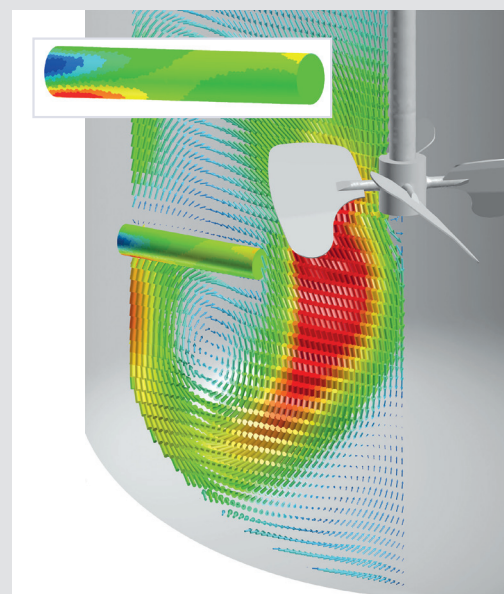
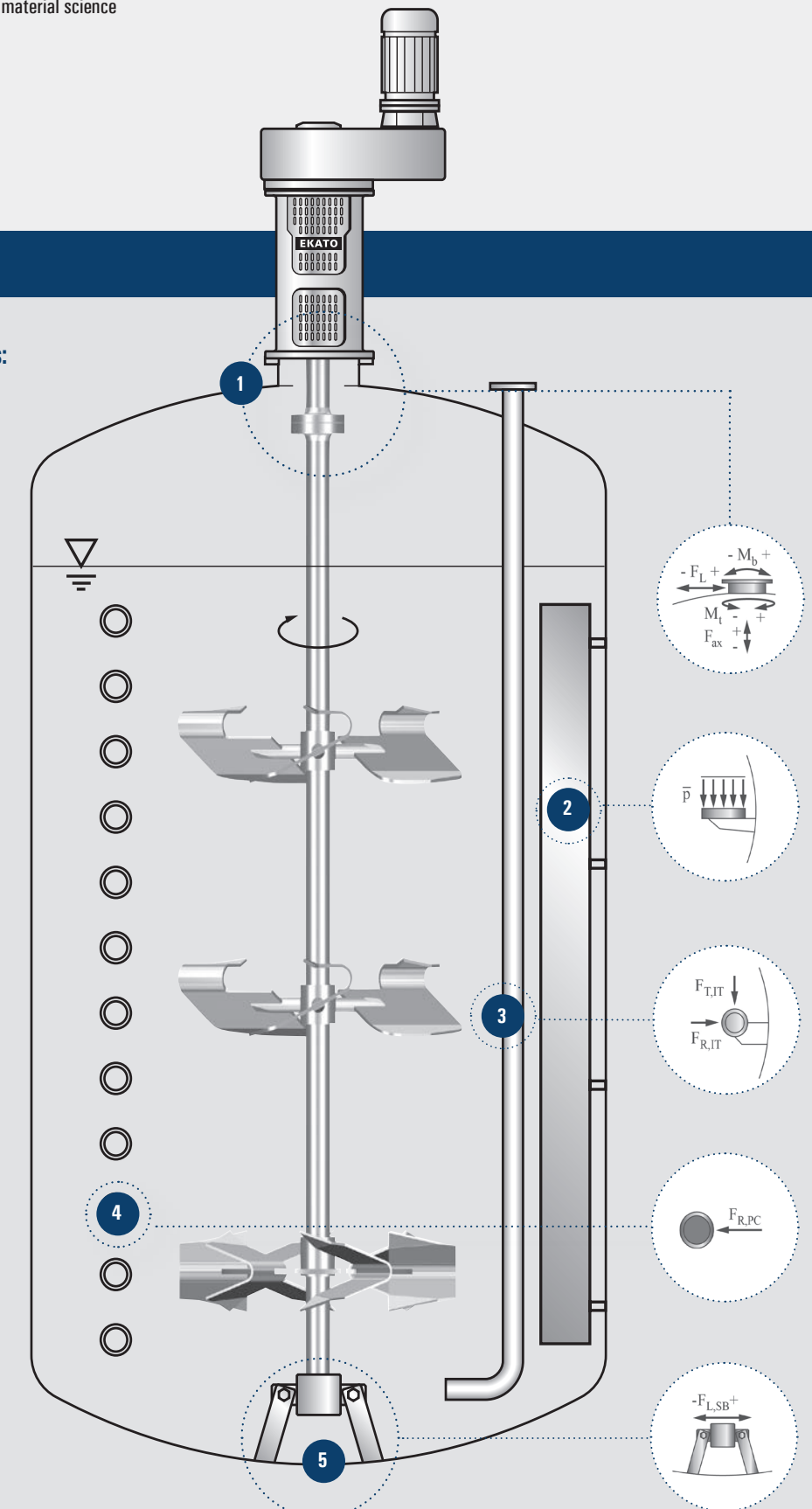
- A** Computational Fluid Dynamics (CFD) to determine loads on internals
- B** Modal analysis to determine natural frequencies to exclude the risk of resonance
- C** Stress and deformation analysis : Calculation of operational stiffness and fatigue stress according to international regulations (ASME, AD, EN)
- D** Transient thermal and thermo-mechanical calculations to simulate temperature distributions as well as the resulting thermally induced stresses and expansions

### Finite Element Analysis (FEA) of the vessel and internals is recommended in cases of:

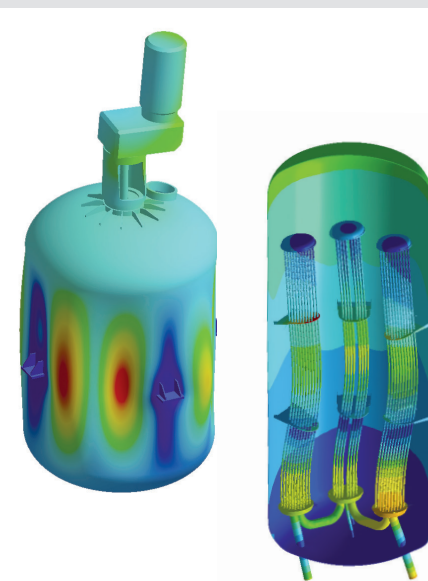
- Process modifications involving higher power inputs high loads/bigger agitators
- Vessels that are retrofitted with agitators specifically bottom entry agitator
- Large leaching tanks or example with bridges
- Thin-walled vessels such as fermenters with low operating pressures
- Vessels with large size reactors for world-scale plants

### Typical loads on vessel components:

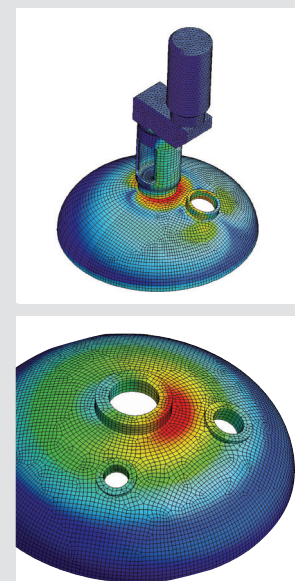
- 1 Agitator nozzle
- 2 Baffles
- 3 Dip pipe
- 4 Coils / heat exchanger
- 5 Steady bearing



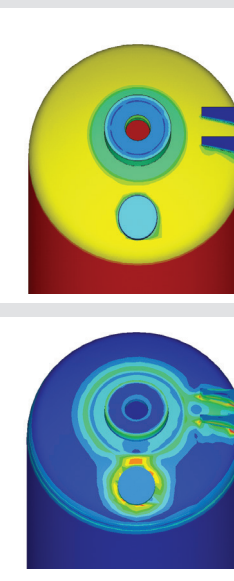
**A** Flow simulation to determine loads on internals



**B** Modal analysis to determine natural frequencies



**C** Stress and deformation analysis



**D** Thermo-mechanical calculations