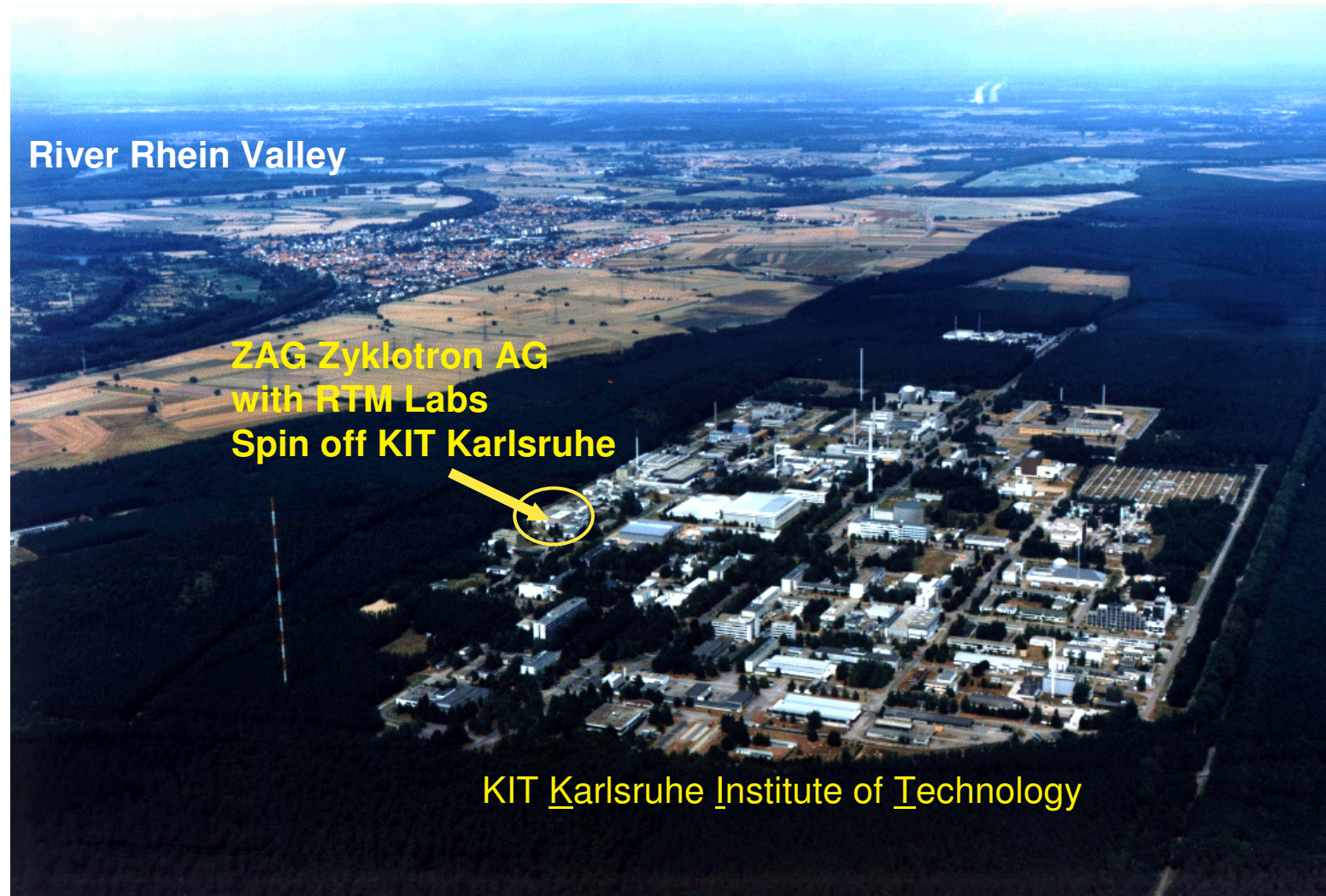


**FIRST BERN CYCLOTRON  
SYMPOSIUM / June 6-7, 2011**  
ZAG Zyklotron AG



## ZAG Zyklotron AG



River Rhein Valley

ZAG Zyklotron AG  
with RTM Labs  
Spin off KIT Karlsruhe

KIT Karlsruhe Institute of Technology



## **Business of ZAG Zyklotron AG**

**Development, production, marketing of innovative  
radioactive products of highest quality for**

### **ENGINEERING**

- THIN LAYER ACTIVATION**
- WEAR MEASUREMENT  
INSTRUMENTS**

### **MEDICINE**

- 123 I**
- 18 FDG**
- KIPROS**

**Our staff: 26 people, among them 8 graduates**

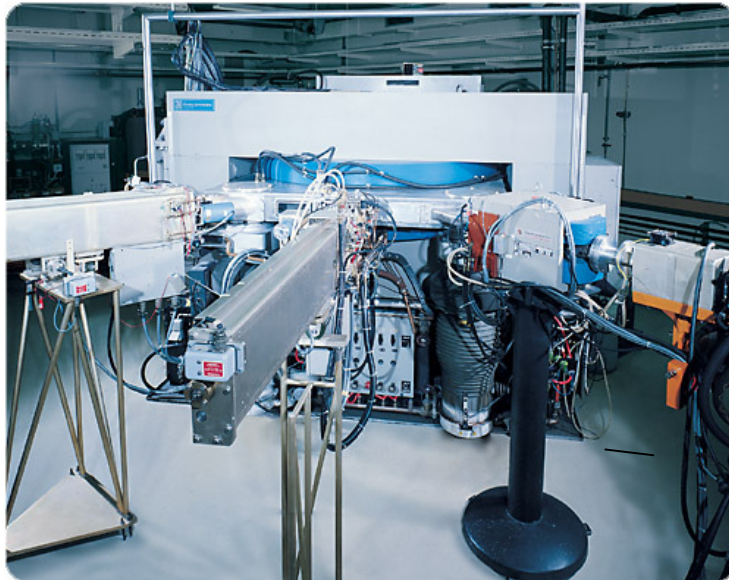




## ZAG Zyklotron AG operates two cycotrons

### KAZ

15 - 40 MeV protons,  
up to 200  $\mu$ A



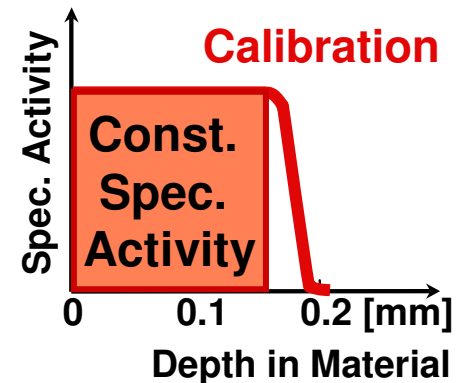
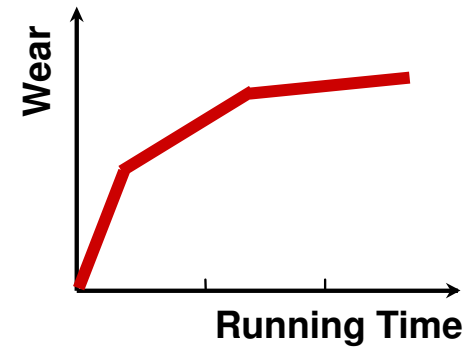
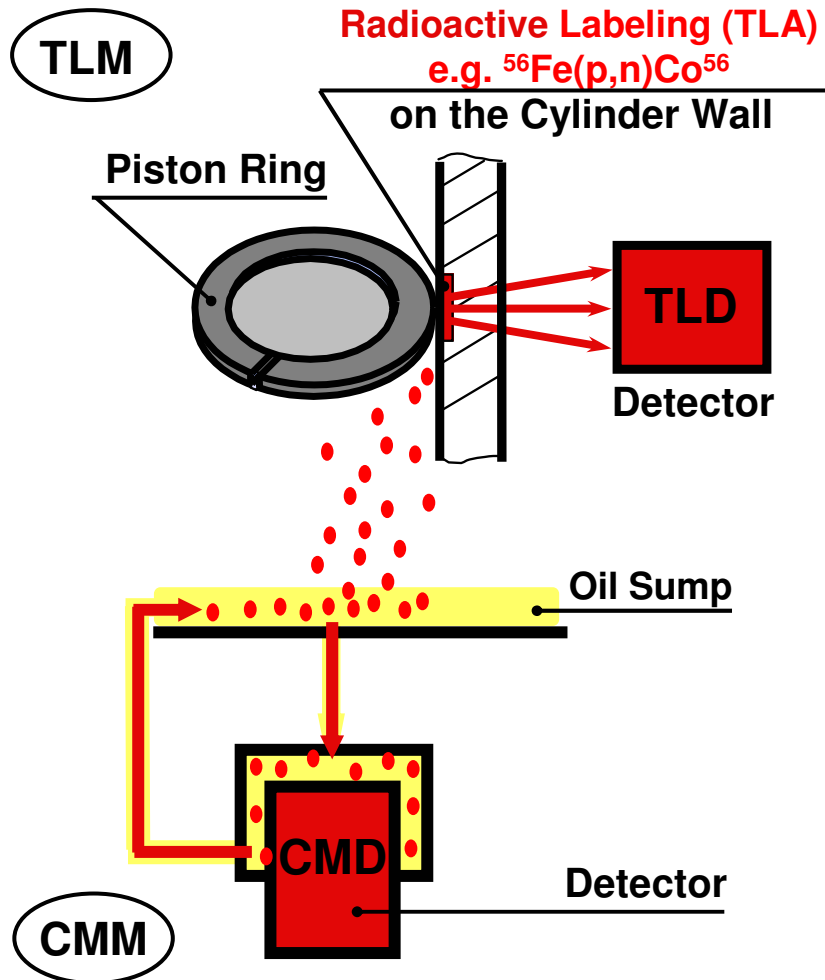
### MIZ

18 MeV protons, up to 250  $\mu$ A  
9 MeV deuterons, up to 60  $\mu$ A





# Working Principle of RTM RADIONUCLIDE-TECHNIQUE in MECHANICAL ENGINEERING





## Progress Steps of RTM in Karlsruhe

1958

1964

2008



- Neutron activation in a nuclear reactor

- Complete part is radioactive

- Some metals

- High effort for radiation protection

- Accuracy:  $\mu\text{g}$ ,  $\mu\text{m}$

- TLA Thin Layer Activation at cyclotron

- Activation depth of 20  $\mu\text{m}$  to 2 mm

- Metals, alloys, some ceramic materials

- Low effort for radiation protection

- Accuracy: sub- $\mu\text{g}$ ,  $-\mu\text{m}$

- UTLA Ultra Thin Layer Activation

- Activation depth in the range of 5  $\mu\text{m}$

- Most of synthetic and ceramic materials (DLC, PTFE, PEEK,  $\text{Al}_2\text{O}_3$ , etc.)

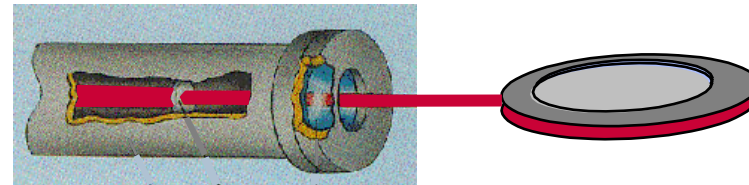
- Very low effort for radiation protection

- Accuracy: ng, nm

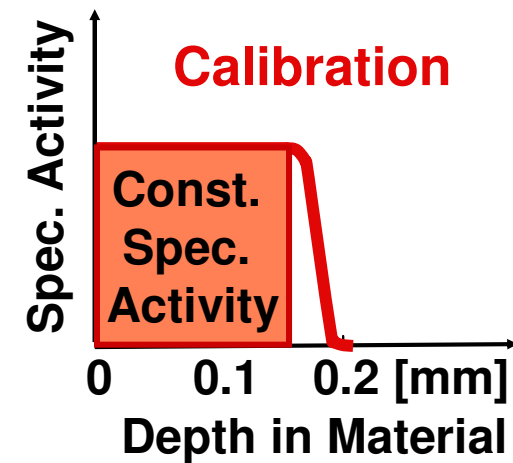
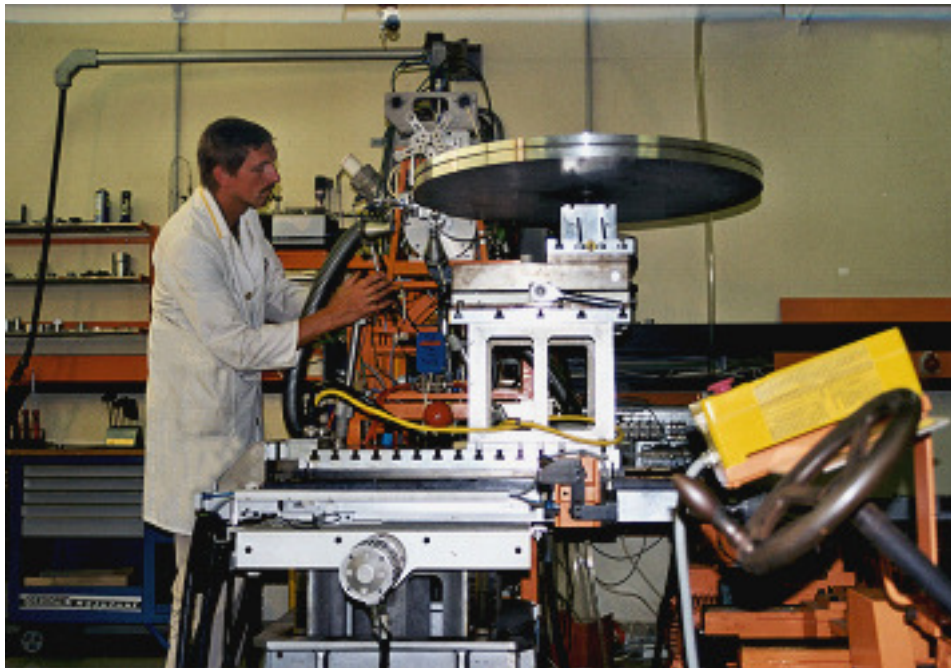


# RTM - RADIONUCLIDE-TECHNIQUE in MECHANICAL ENGINEERING Wear- and Corrosion-Diagnostics of Running Machines and Processing Engineering

## RTM - Activation Service



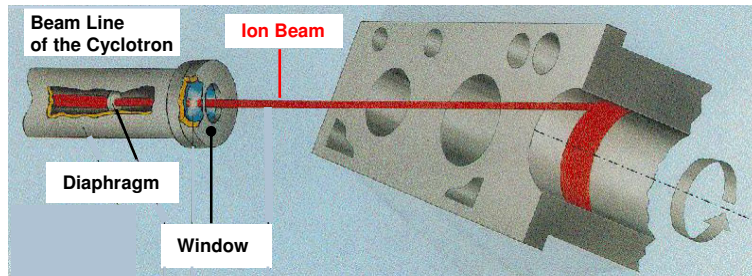
Set-up of a piston ring of a marine diesel engine  
in front of the beam head for irradiation



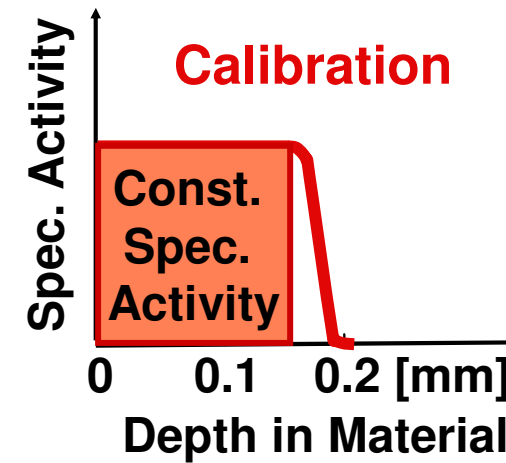
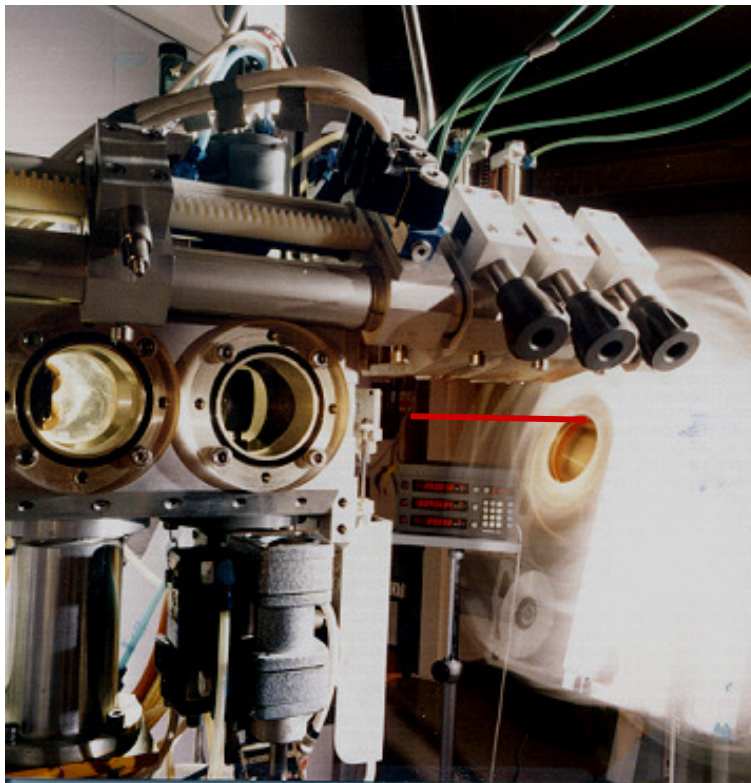




# RTM - RADIONUCLIDE-TECHNIQUE in MECHANICAL ENGINEERING Wear- and Corrosion-Diagnostics of Running Machines and Processing Engineering



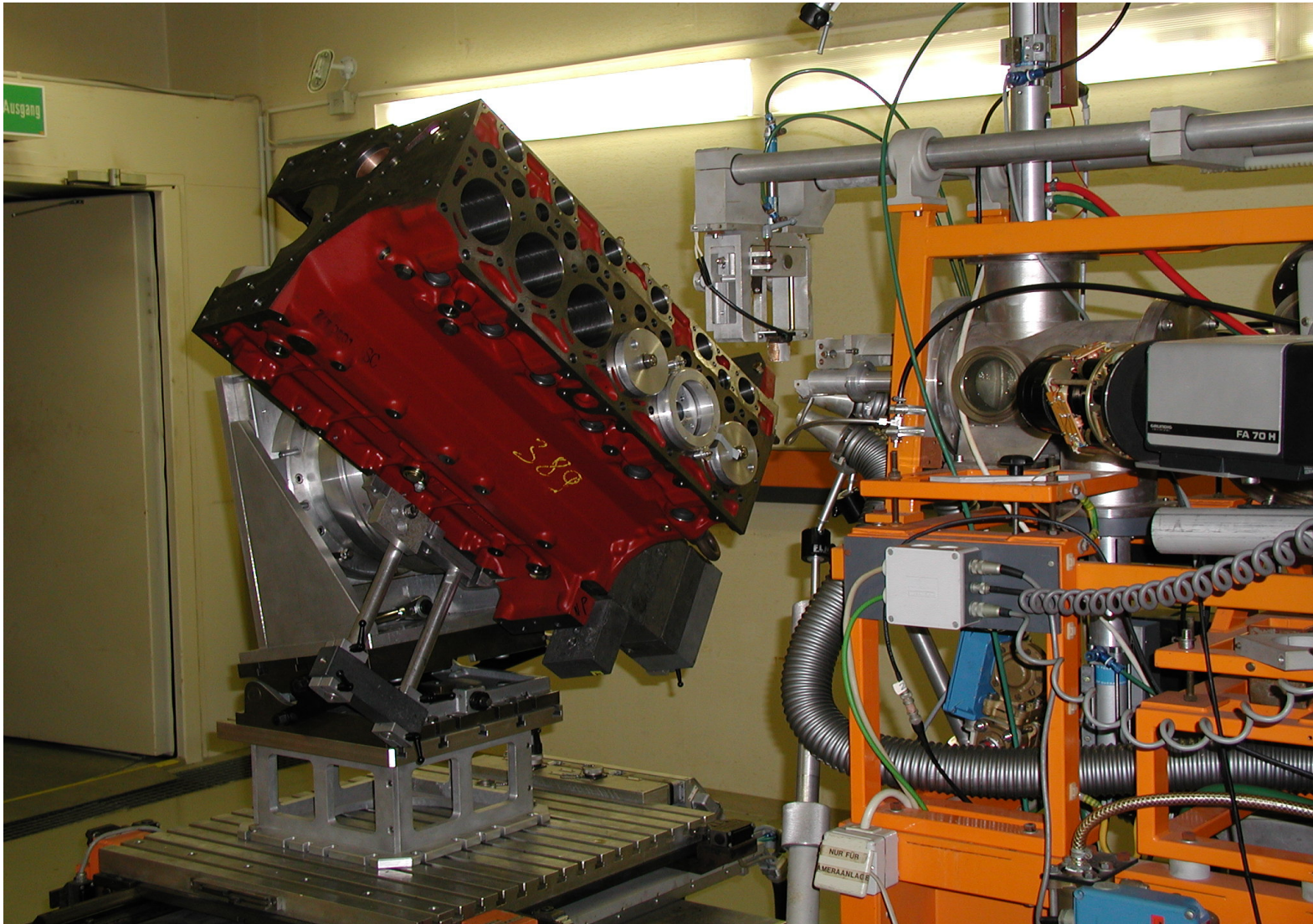
## ACTIVATION of a cylinder block







## Heavy Cast Iron Crankcase in Activation Position







## Set of Rail-Wheels of a High-Speed Train for Thin Layer Activation

