



SOCIO-ECONOMIC ASPECTS

PROHIPP – 4TH REPORTING PERIOD GENERAL MEETING

VIC (Barcelona) on 26th and 27th May 2008



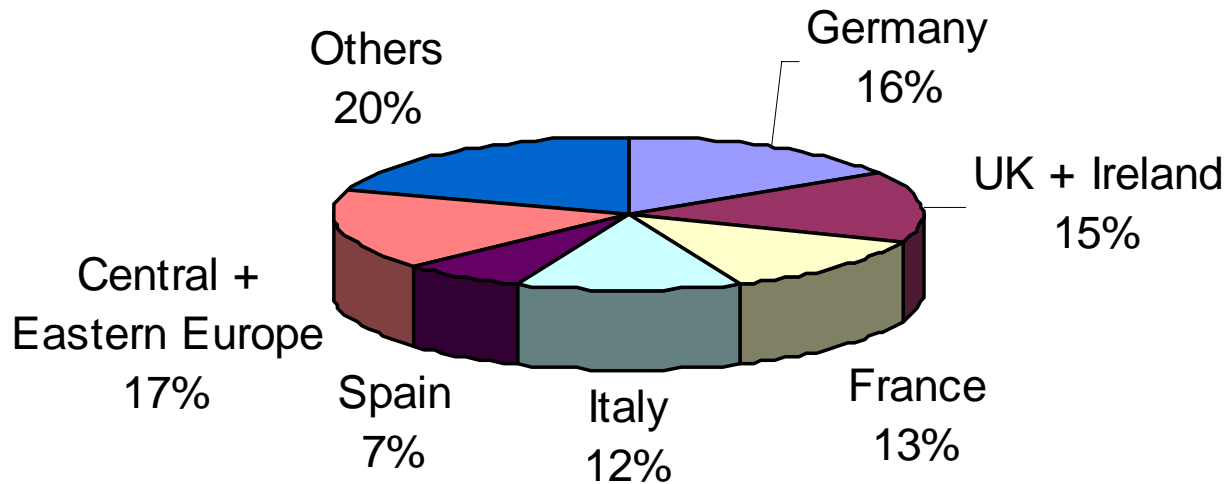
T10.1 Potential impacts

- 1. Tracker markets for mobile hydraulic cylinders:**
 - a) Construction machinery (≈ 8 cylinders/machine)
 - b) Agricultural tractors (≈ 4 cylinders/machine)
- 2. Mobile hydraulic cylinder markets (estimated)**
- 3. Conditioning factors:**
 - a) Raw material availability/cost
 - b) Exchange rates
 - c) Others
- 4. Potential impact from PROHIPP knowledge:**
 - a) Improved and PREDICTABLE product life
 - b) Reduced material content without downside
 - c) Innovative materials and processes > original & cost-effective design solutions



T10.1 Tracker markets – 1a Construction machinery

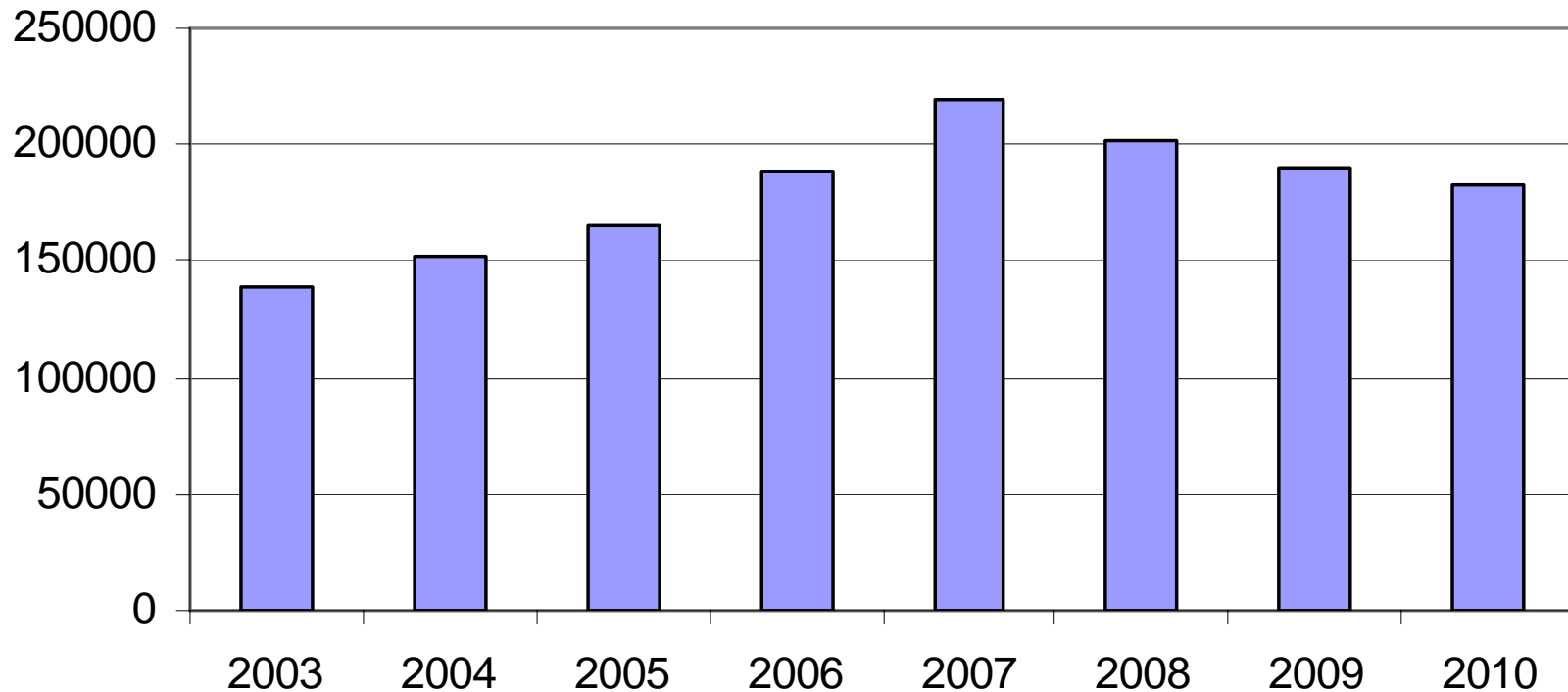
Construction machinery sales in Europe 2007 (total quantity = 219 000 units)



Sources: Committee for European Construction Equipment, Off-Highway Research (UK),

UNACOMA (IT), VDMA (D)

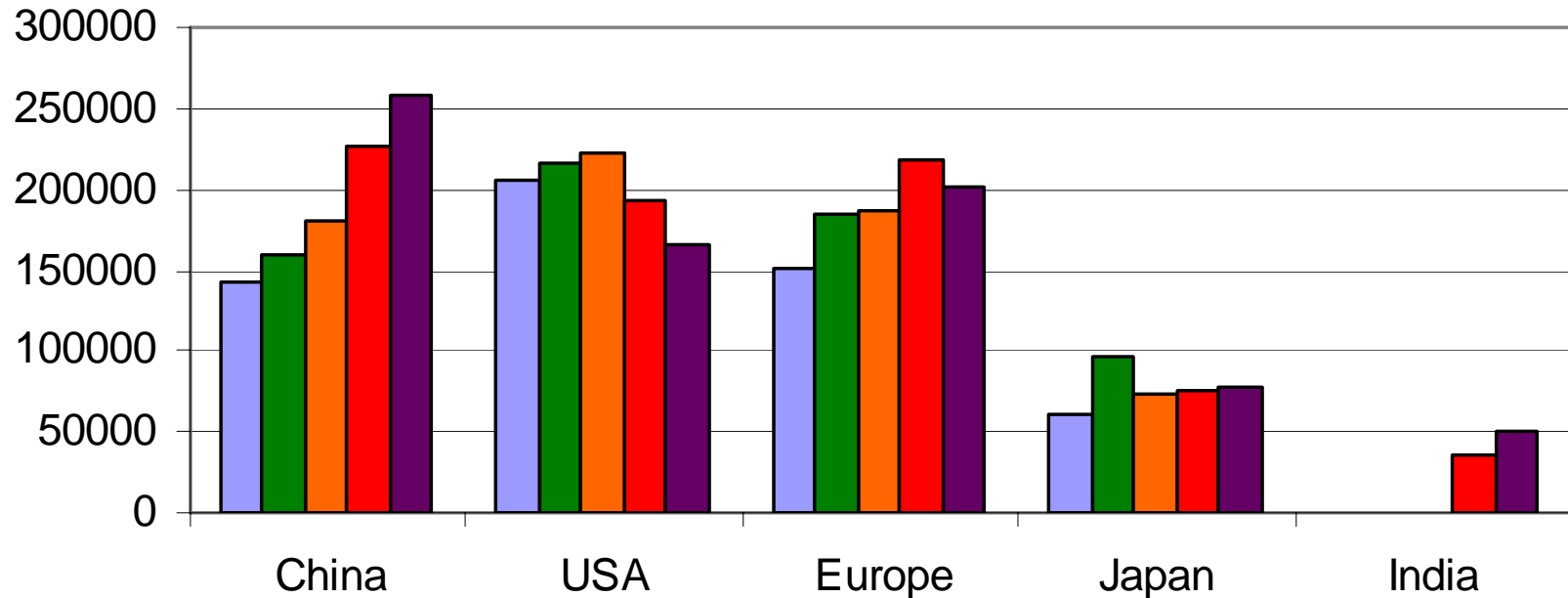
Construction machinery sales in Europe (units)



Sources: Committee for European Construction Equipment, Off-Highway Research (UK), UNACOMA (IT), VDMA (D)

Construction machinery sales (units)

2004 2005 2006 2007 2008

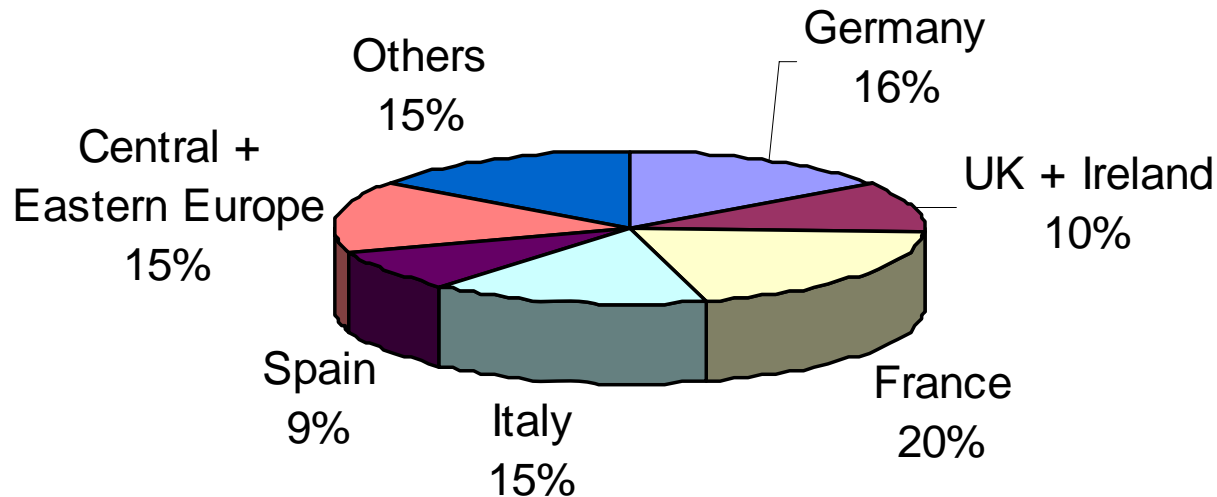


Sources: Committee for European Construction Equipment, Off-Highway Research (UK), UNACOMA (IT), AEM (USA)



T10.1 Tracker markets – 1b Agricultural tractors

Agricultural tractor sales in Europe 2007 (total quantity = 190 079 units)

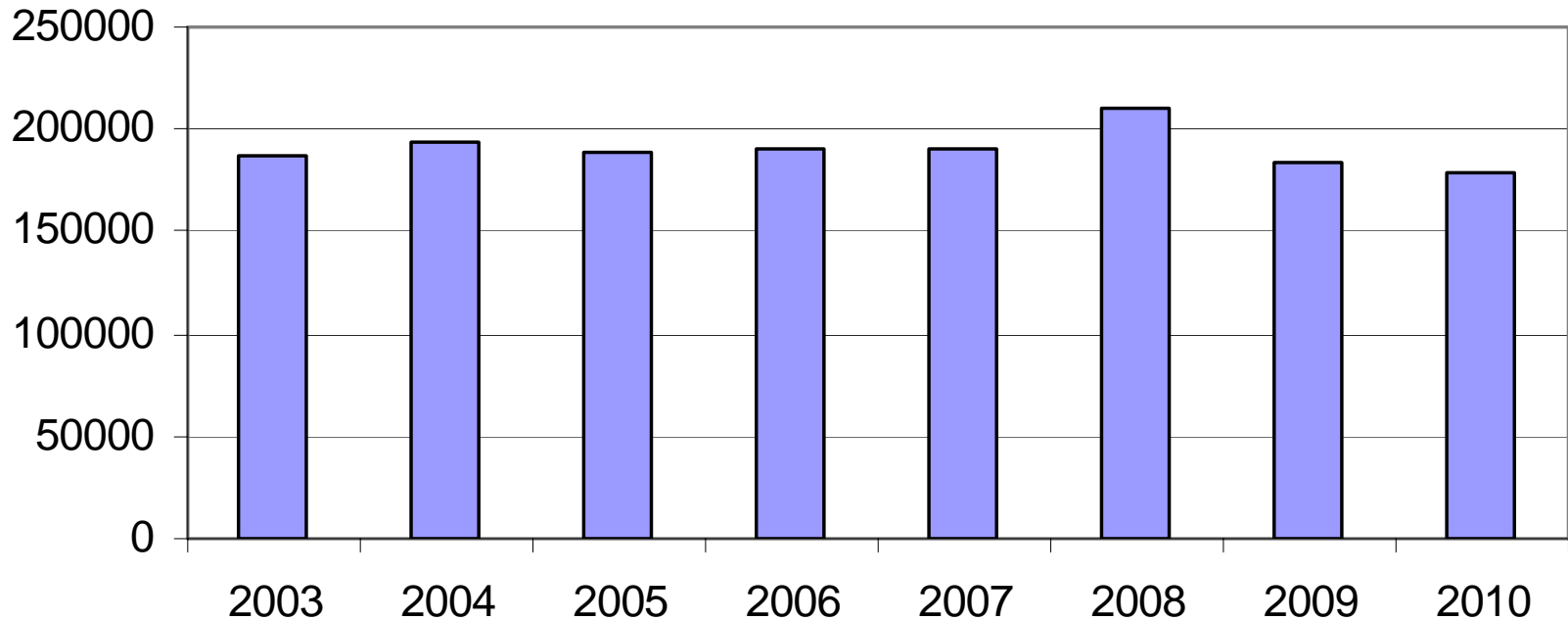


Sources: VDMA (D), SYGMA (F), ACAP (P), DGT (E), Kubota (Spain, USA & Japan)



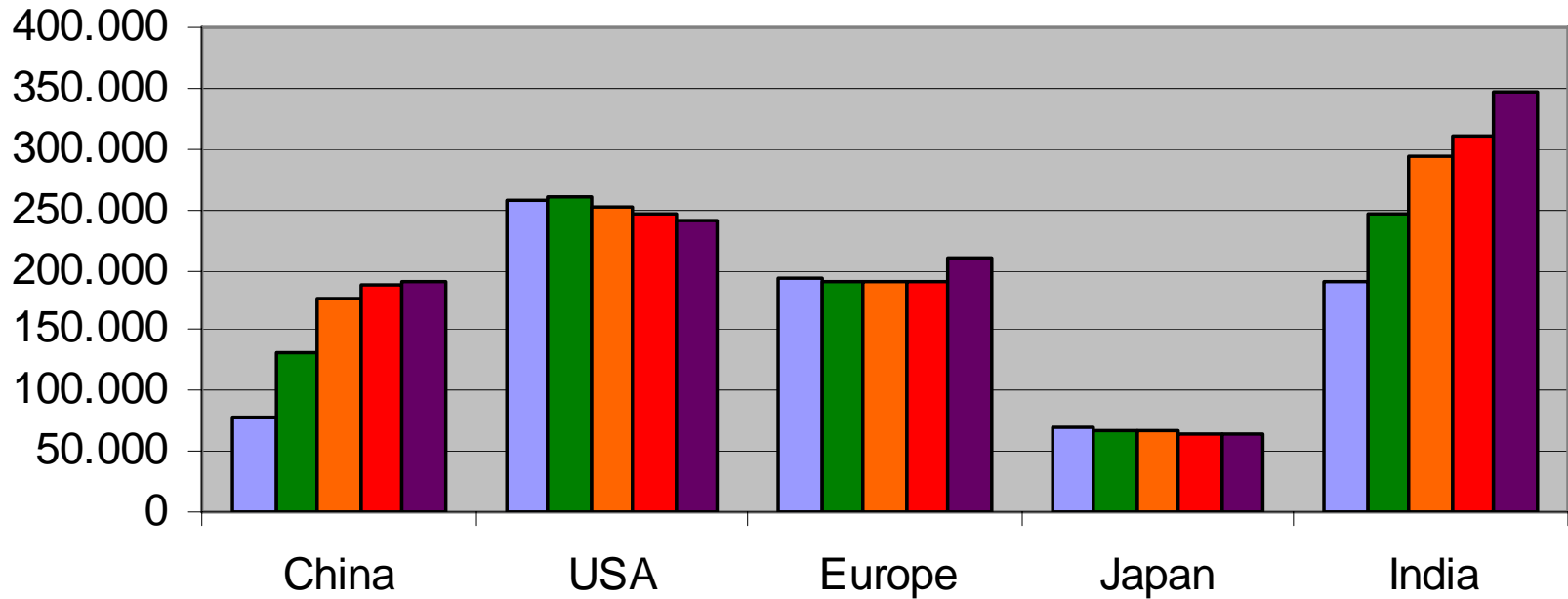
T10.1 Tracker markets – 1b Agricultural tractors

Agricultural tractor sales in Europe (units)



Sources: VDMA (D), SYGMA (F), ACAP (P), DGT (E), Kubota (Spain)

Tractor sales (units)



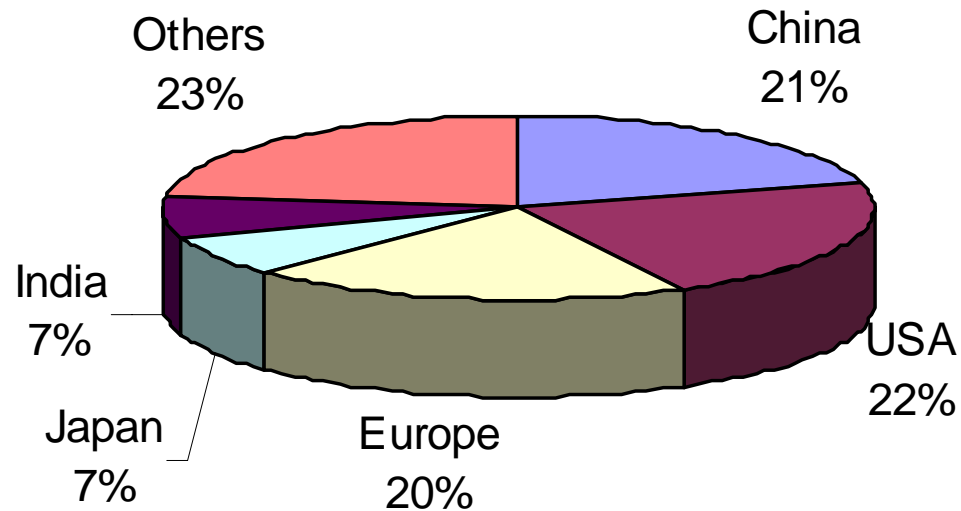
Sources: VDMA (D), SYGMA (F), ACAP (P), DGT (E), Kubota (Spain, USA & Japan), Off-Highway Research (UK)

Indian Tractor Manufacturer's Association



T10.1 Mobile hydraulic cylinder markets (estimated)

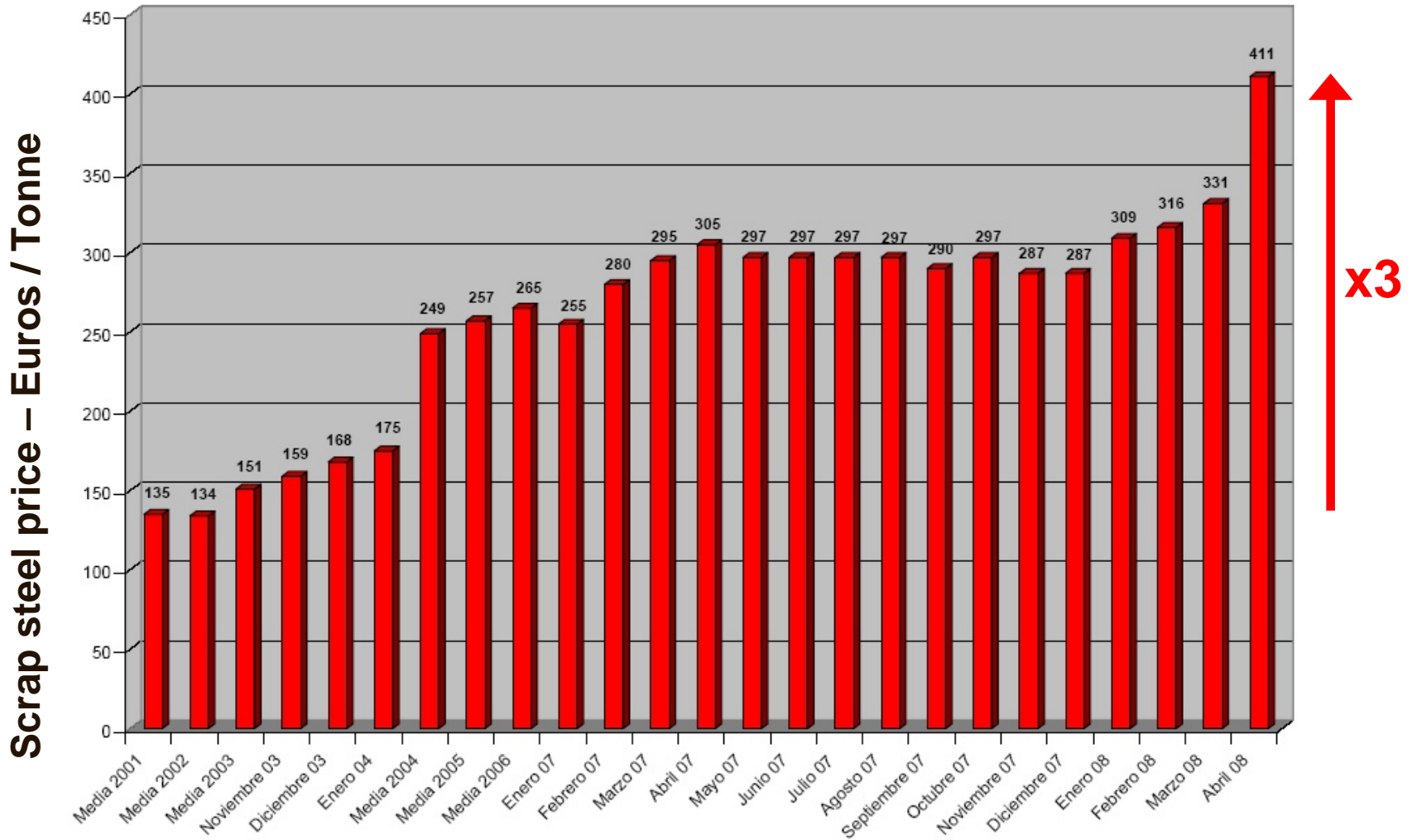
Mobile hydraulic cylinder markets (2007 estimated world market 58 million cylinders)



Sources: CETOP, AIFTOP, BFPA, NFPA, JFPA, + Roquet estimations



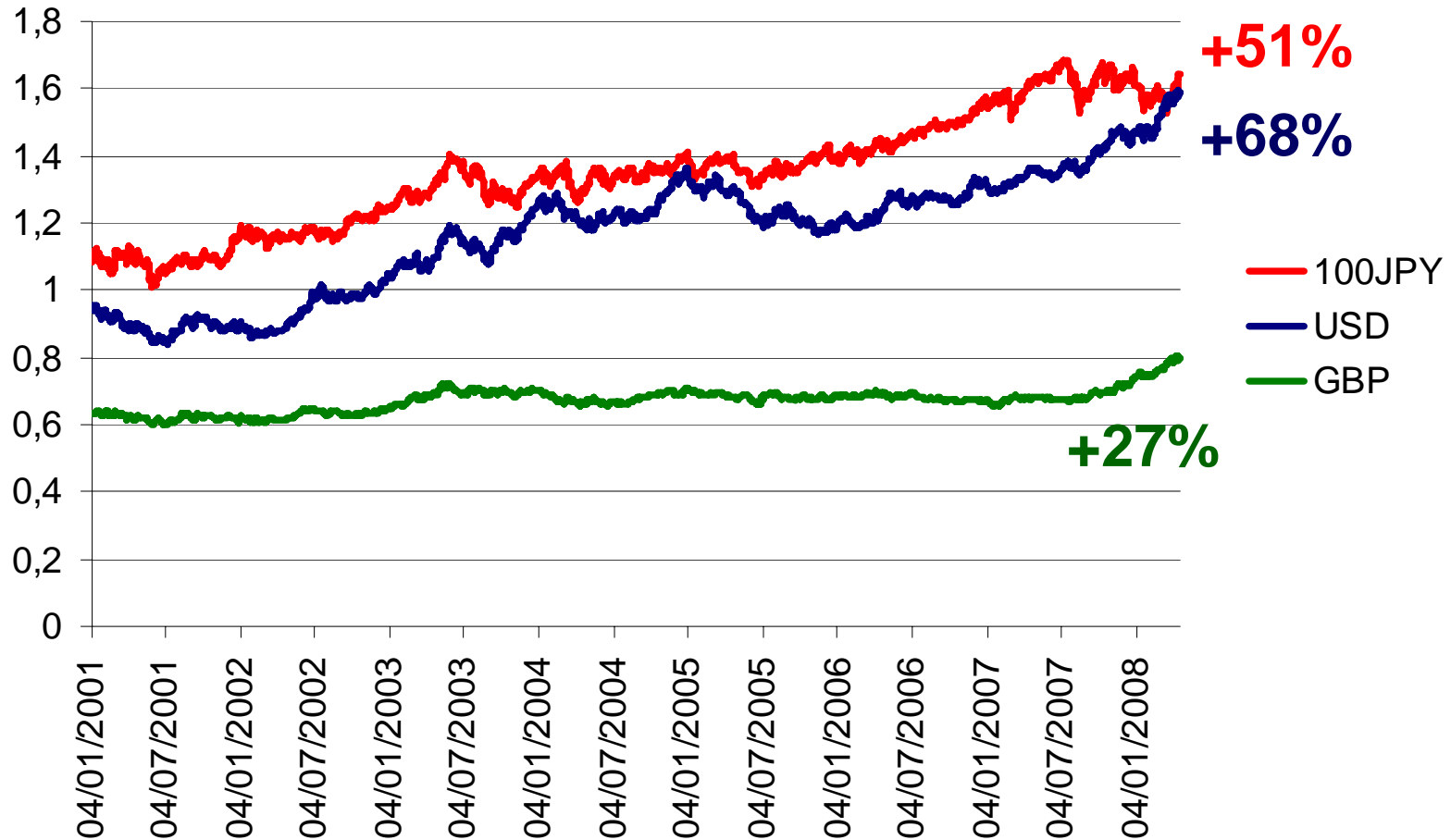
T10.1 Conditioning factors – 2a Raw material availability/cost





T10.1 Conditioning factors – 2b Exchange rates

Euro exchange rates



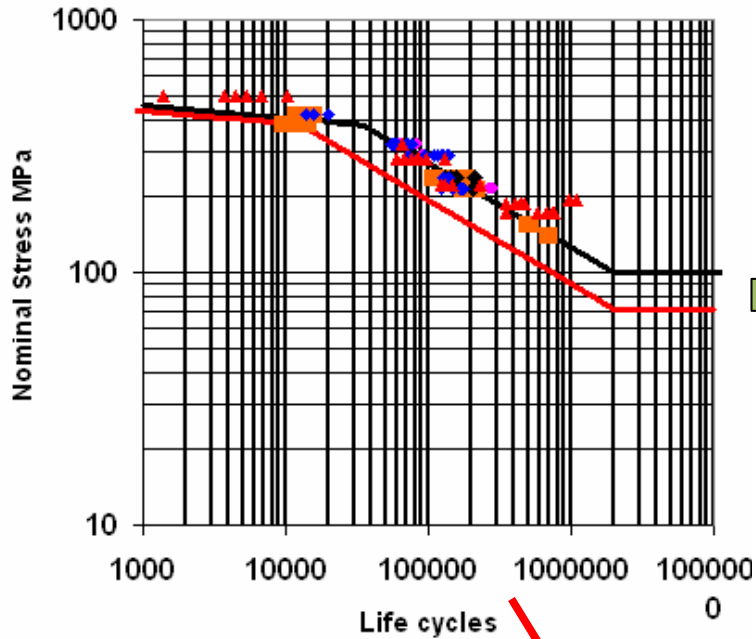


T10.1 Conditioning factors – 2c Others

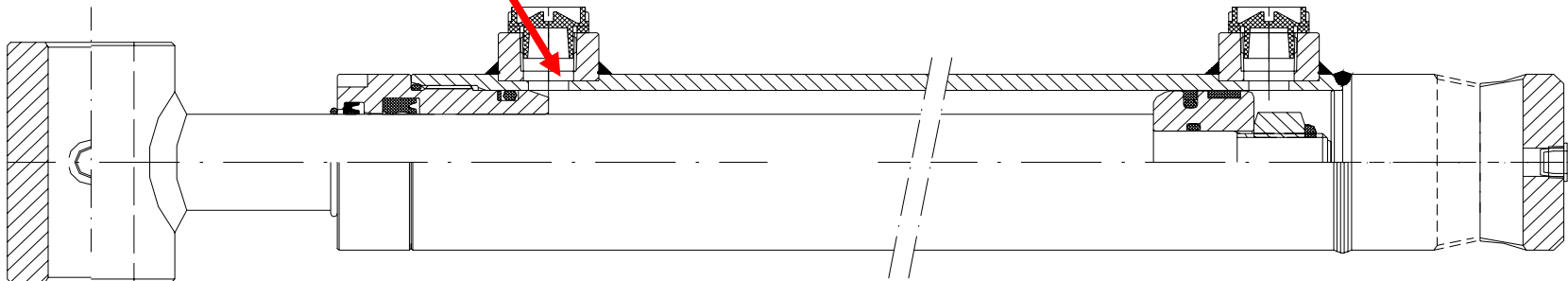
- Housing/bank crisis USA (early-2007) and UK (early 2008)
- Housing crisis Spain and Ireland (mid-2007) – other countries to follow?
- Payment terms large rental customers
- Oil Price / Energy prices
- Cereal prices
- Rising interest rates and inflation
- Political uncertainty in USA
- Low-cost machines from China?
- “Grey” market imports from Japan etc.
- CE marking, noise and safety standards etc.



T10.1 PROHIPP knowledge impacts – 4a product life



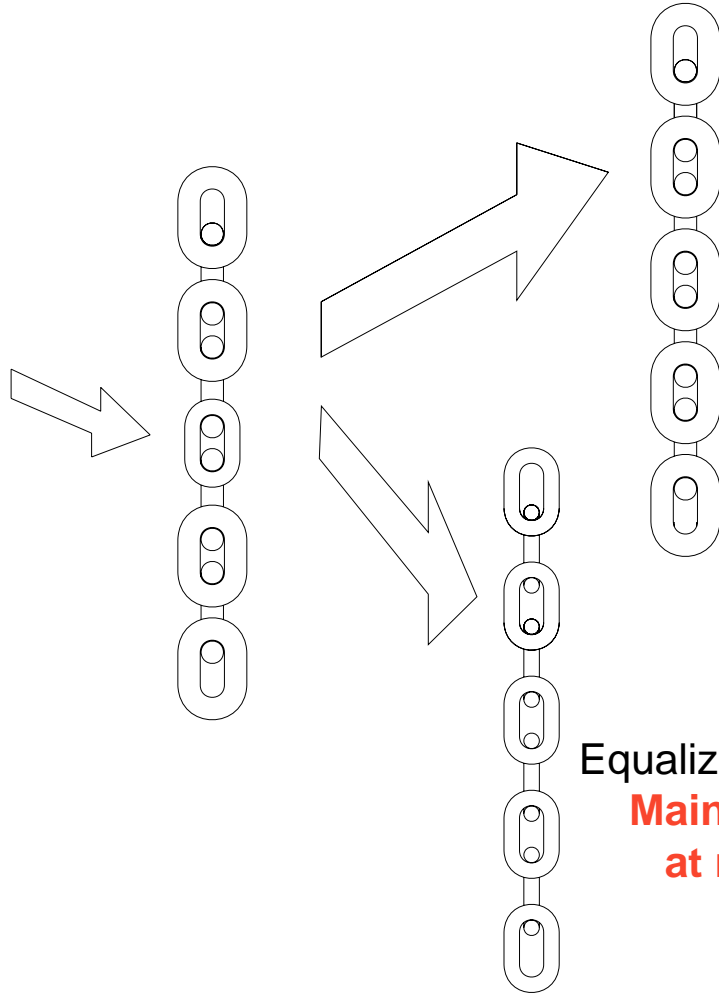
Endurance test		200 bar	
$\sigma_{max} = P \frac{D_e^2 - D_i^2}{D_e^2 - D_i^2}$		Port hole expected life	
		nominal stress: <input type="text" value="157"/> N/mm2	
Expected life:		Reliability:	
<input type="text" value="513.810"/>	cycles	<input type="text" value="50%"/>	
<input type="text" value="190.300"/>	cycles	<input type="text" value="100%"/>	****
<input type="text" value="400.000"/>	cycles	<input type="text" value="71,7%"/>	
End - Cap weldings expected life		c	
$\sigma_{rc} = \sqrt{\sigma_{ft}^2 + 3 \cdot \tau^2}$		<input type="text" value="77"/> N/mm2	
		Reliability:	
<input type="text" value="1.863.059"/>	cycles	<input type="text" value="50%"/>	
<input type="text" value="582.206"/>	cycles	<input type="text" value="100%"/>	
<input type="text" value="400.000"/>	cycles	<input type="text" value="100,0%"/>	
Tube expected life (thead run-out)			
Stress M Pa.	<input type="text" value="64"/>	<input type="text" value="107"/>	
Rod chamber force:	reliab.	Total force:	Reliab
cycles	<input type="text" value=">2 10^6"/>	<input type="text" value="50%"/>	<input type="text" value="1.049.766"/>
cycles	<input type="text" value="664.341"/>	<input type="text" value="100%"/>	<input type="text" value="139.969"/>
nom. cycles	<input type="text" value="400.000"/>	<input type="text" value="100,0%"/>	<input type="text" value="400.000"/>
rod head : (Press. In rod chamber)			
Stress M Pa.	<input type="text" value="94"/>		
<input type="text" value="524.294"/>	cycles	<input type="text" value="50%"/>	
<input type="text" value="131.073"/>	cycles	<input type="text" value="100,0%"/>	***
<input type="text" value="400.000"/>	cycles	<input type="text" value="82,9%"/>	





T10.1 PROHIPP knowledge impacts – 4b less material content

The chain is as strong as the weakest link



Strategy A
Reinforce the weak link
Increase load capability at nearly the same cost

Strategy B
Equalize the strength of all the links
Maintain the load capability at reduced material cost



T10.1 PROHIPP impacts – 4c innovative materials / processes

1. **Cast-iron cylinders**

- a) Short-stroke cast vertically for high-yield
- b) Hollow cores for low cost and excellent gas-removal

2. **Cylinder piston-over-port damping**

- a) Low cost if honing tubes after welding
- b) Not highly diameter-tolerance dependant
- c) “Tuneable” to application with groove spacing

3. **Cylinder rod plating process**

- a) Less chrome
- b) Higher corrosion resistance

1. Resistance to change

- a) Change = risk and/or threat
- b) Investment for new product or process
- c) Perceived “pay-off”

2. Visibility

- a) Exhibitions
- b) Technical press / magazines
- c) Internet

3. Peer pressure

- a) Major customers using technology
- b) Competitors using technology

1. Resistance to change

- a) Change = risk and/or threat
- b) Investment for new product or process
- c) Perceived “pay-off”

2. Visibility

- a) Exhibitions – BAUMA Shanghai 2006, Hannover 2007, BAUMA (D) 2007, BICES Beijing 2007, CONEXPO (USA) 2008, BAUMA Shanghai 2008
- b) Technical press / magazines – IVT Annual Review July 2008
- c) Internet – PROHIPPP.com, project participant webs etc.
- d) Video – May 2008

3. Peer pressure

- a) Major customers using technology
- b) Competitors using technology