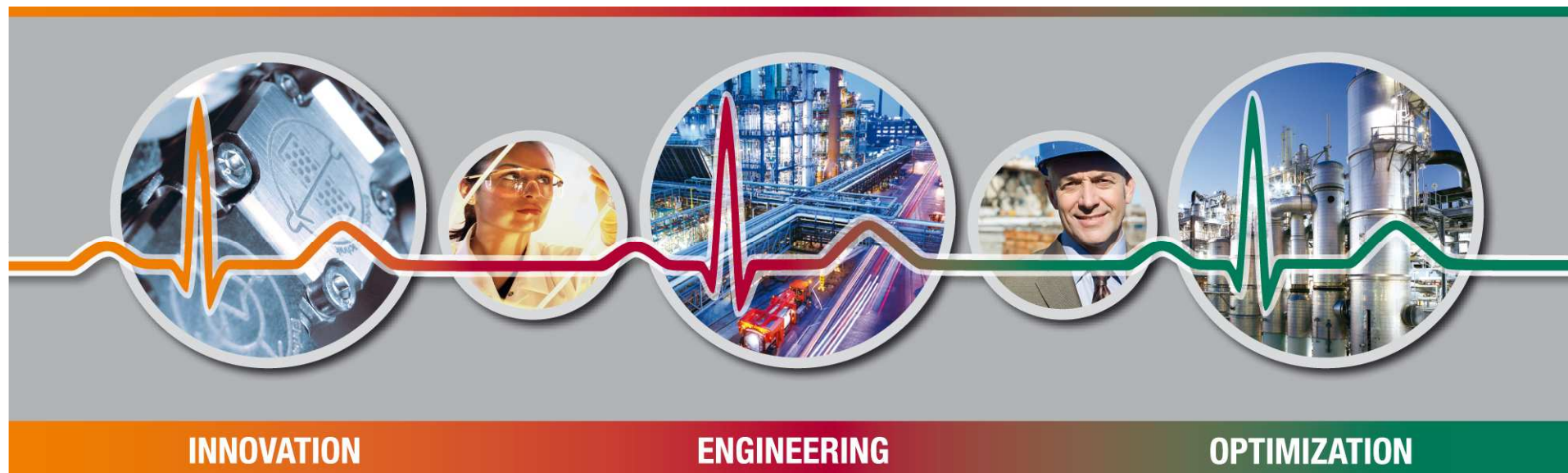


Powering Your Performance



INNOVATION

ENGINEERING

OPTIMIZATION

Plenary Session II: State of the Art Technologies

Industrial Chemical Safety

Save and Sustainable Logistics for Hazardous Goods: Handling, Labeling and Distribution/Warehousing

Prof. Dr. Ludger Brüll

Conference on Chemical (Industrial) Disaster Management

Convention Center, Renaissance, Powai

Mumbai, India

February 15th, 2010



Bayer Technology Services

Bayer: Science For A Better Life



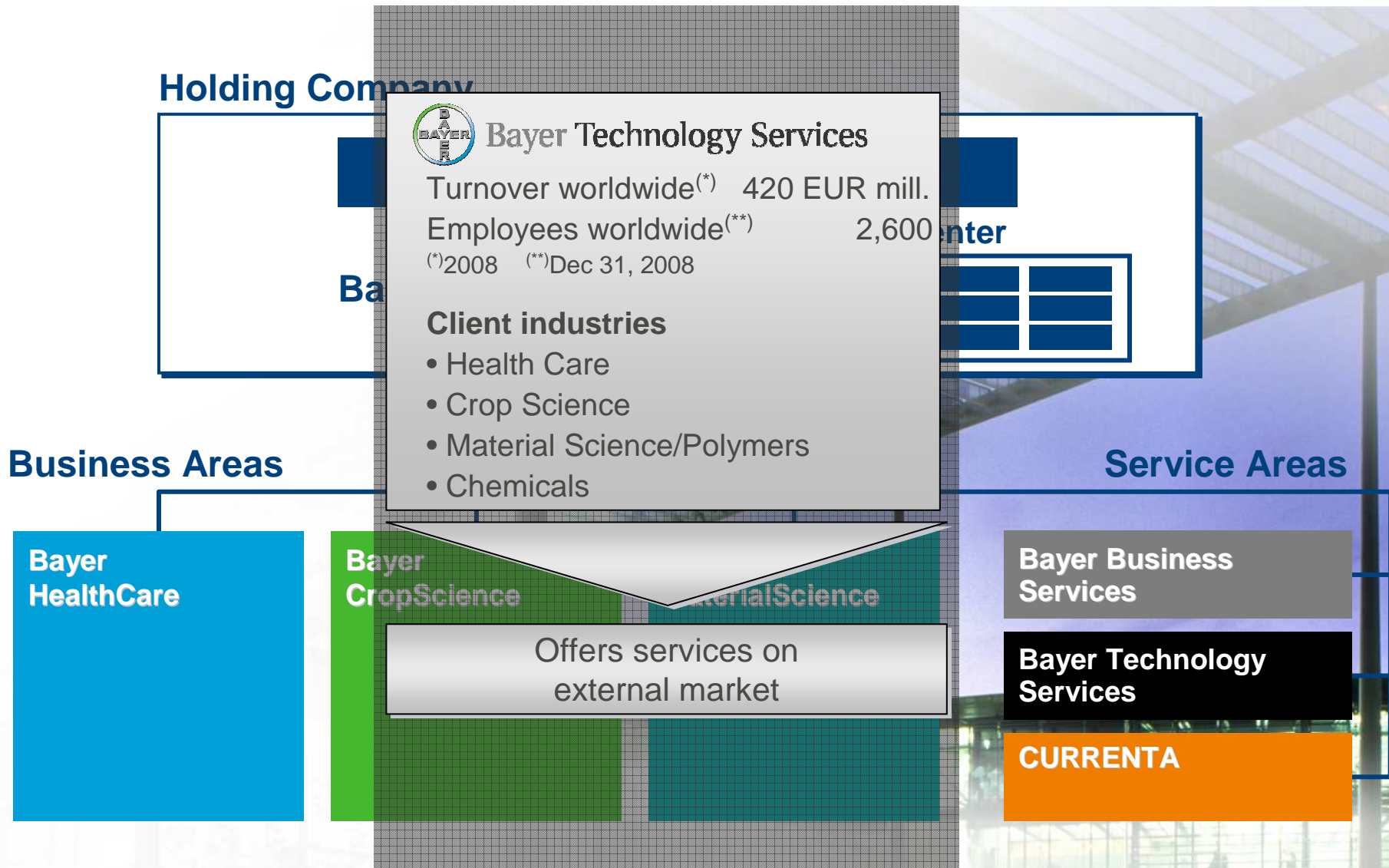
■ Bayer – Facts and Figures 2008

- 108,600 employees worldwide
- 316 companies
- 5,000 products
- Sales: 32,918 EUR million
- EBIT: 3,544 EUR million
- Net income: 1,719 EUR million
- R&D expenses: 2,653 EUR million
- Capital expenditures: 1,982 EUR million

■ Bayer – Objectives

- Leader in research and technology
- Continuous growth of expertise in the manufacture of high-quality and environmentally compatible products

Bayer Technology Services – a Bayer Group Company



Save and sustainable logistics for hazardous goods

Hazardous goods in

Production	Distribution / Logistics
Local, materials only at production sites	Global, materials appear everywhere (along the supply chain)
High volumes of material	Low volumes during transport
Local regulations (one country)	Local regulations (several countries) and „global“ regulations
Trained personnel at the sites	Untrained personnel, „anyone“
A lot of preventive measures against hazards installed (e.g. plant fire brigade, fire fighting systems)	Preventive measures throughout the supply chain more than difficult



Save and sustainable logistics for hazardous goods

Hazardous goods accident in Ratingen (Germany)

- Accident during unloading of 200 I-drums
- Contents of a drum withdrew completely
- The drum did not have a hazardous materials labeling



Save and sustainable logistics for hazardous goods

Hazardous goods accident in Leverkusen (Germany)

- Two hazardous goods transporters collided
- Dangerous materials did not withdraw



Save and sustainable logistics for hazardous goods

Measures in logistics to handle hazardous goods

- Fulfill national/local laws and regulations
- Meet internal best practice standards (e.g. BAYER warehouse manual, HAZOP-Studies)
- Automation to verify and secure operation
- State of the art processes
 - IT Management (customer supply process is secured in accordance with hazardous materials law)
- State of the art technology (examples)
 - Handling: Dust-proof filling equipment
 - Labeling: GHS requirements
 - Warehousing: Bayer Warehouse Manual



Handling

Big-Bag Emptying, Dust-proof regarding to Chemical Acts

Feeding and discharging of solids dustproof out of one way trading units into closed production systems

Customer requirements:

- Regulatory requirements: ChemG / Reach
- Operator protection: Reduction of dust discharge
- Product protection: QS- or GMP-requirements



BTS-Achievement:

- Consulting independent of producers and technologies
- Customizing merchantable Systems
- Project management
- Solution Provider for complex challenges

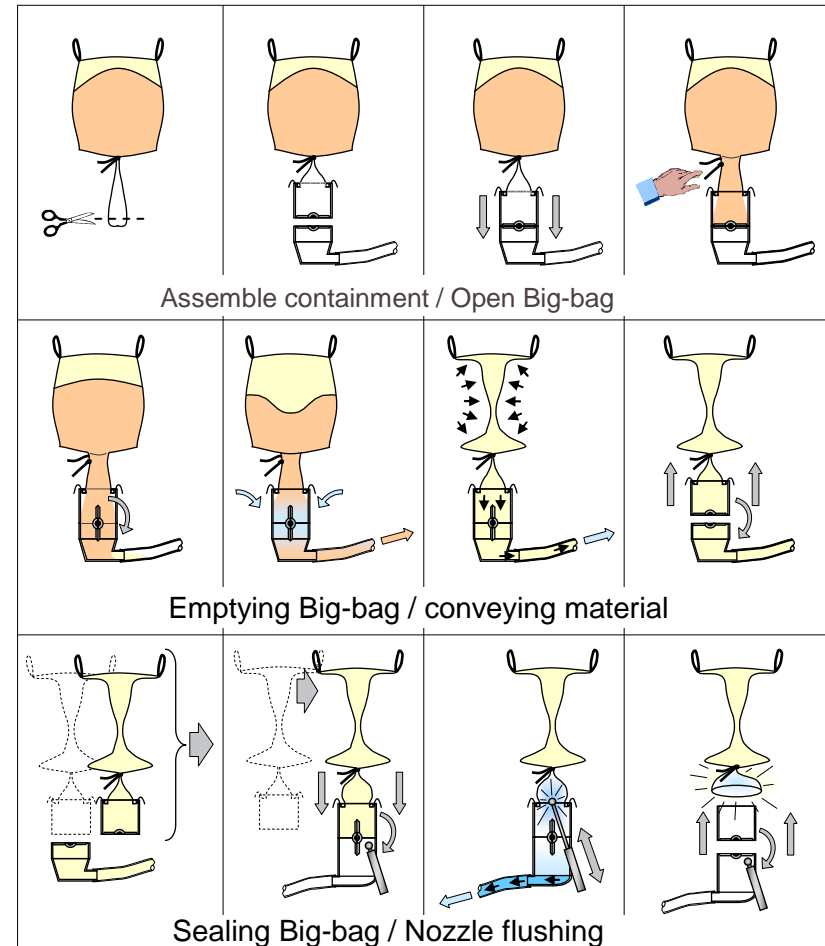
Big-Bag Emptying, Dust-proof regarding to Chemical Acts

Technical Solution

- Development and patent granting of a new system (Collaboration between BCS, Novindustria as equipment supplier and BTS-PMT-SCL as solution provider)
- Adoption of low-level contamination clamp system on non standard big-bag, CIP flushing of outgoing nozzle

Benefits

- Proven emission value ($<0,1 \text{ mg/m}^3$), the equipment is accepted by authorities as a closed-system
- Minimum operation cost (e.g. due to one-way container)
- Protection on operator, even without full-protective suit



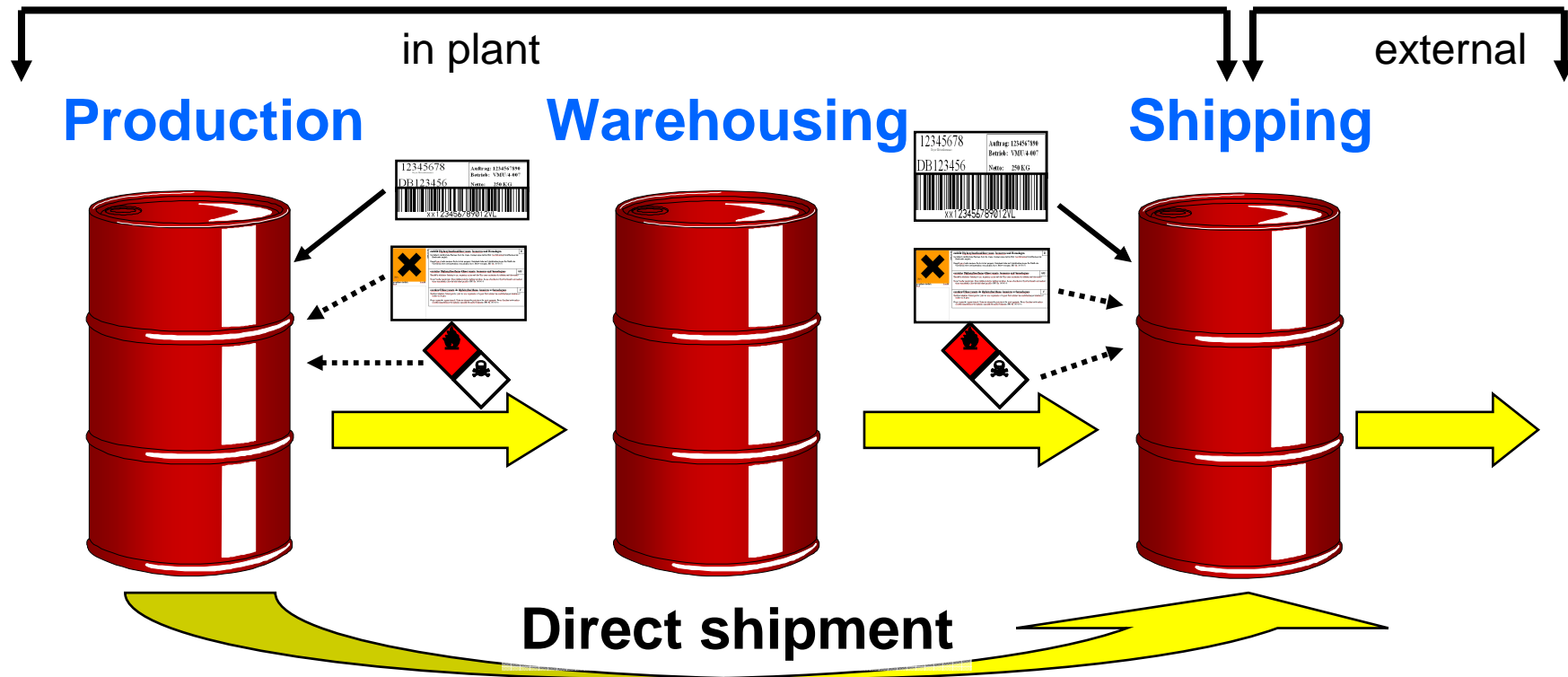
Labeling

Specifications of the GHS Ordinance on Hazardous Substances

- The United Nations' Globally Harmonized System (GHS) is the basis for the harmonization of international and regional systems for the labeling of products.
- The EU has issued an EC directive that makes GHS binding (from 2009). Global transition/implementation period for GHS: 2008 –2015
- Effects: Most regulations for the labeling of hazardous substances must be amended.
 - New hazard symbols
 - New hazard statements
 - New precautionary statements (prevention, reaction, storage, disposal)
 - New classification criteria
 - Signal words: Danger/Warning
 - Product identification
 - Manufacturer's details (name, address, telephone)
 - Country-specific supplementary marking
 - If multiple languages are used, the same information must be provided in all languages.

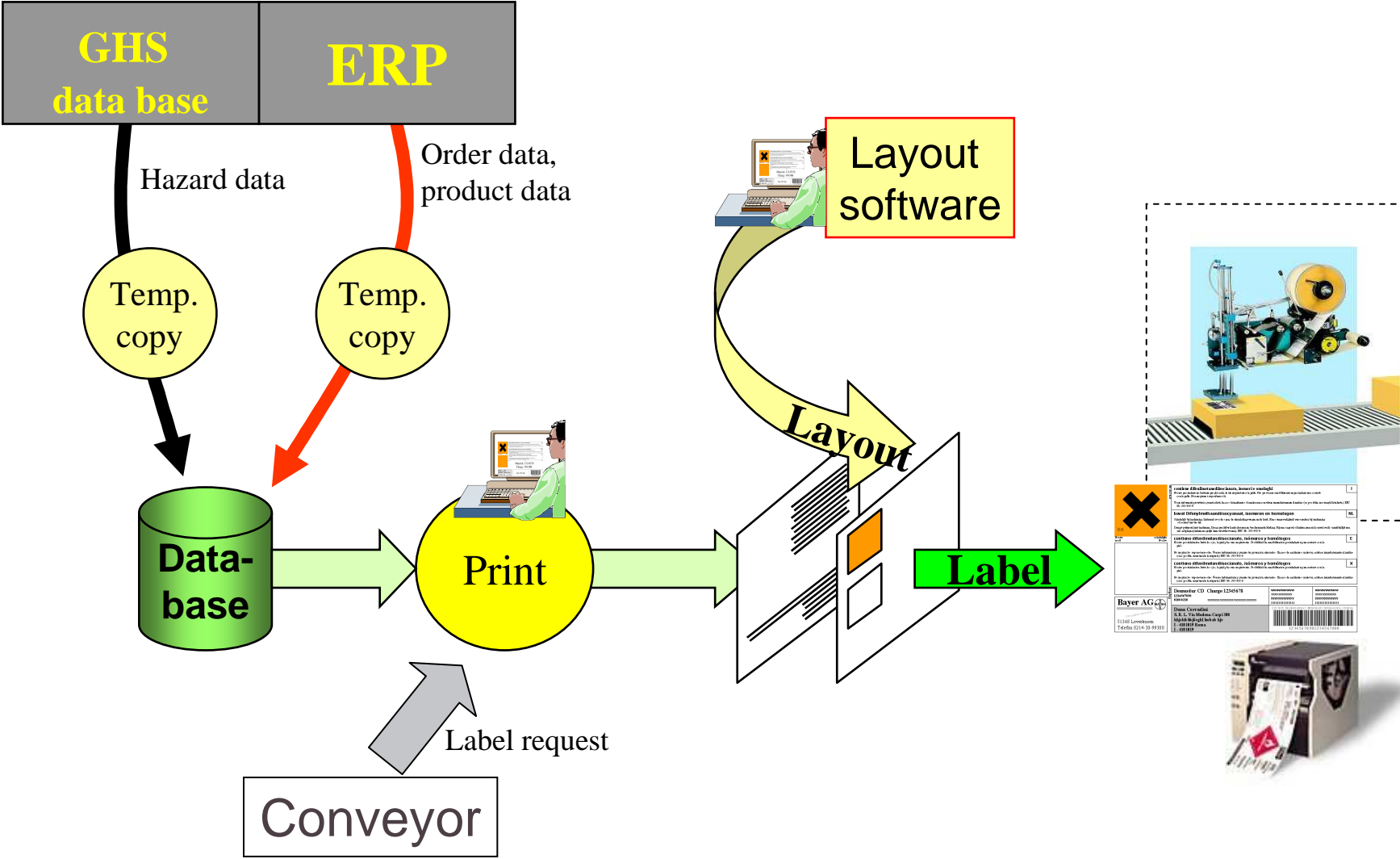


Product labeling in the logistics chain



<p>Product label and either hazardous substance (I) or hazardous goods label At least language of the producing country</p>	<p>Shipping label and if not present product, haz. substance (I, II) + haz. goods label At least language of the destination country</p>
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LEXSY® LabelPrint function model

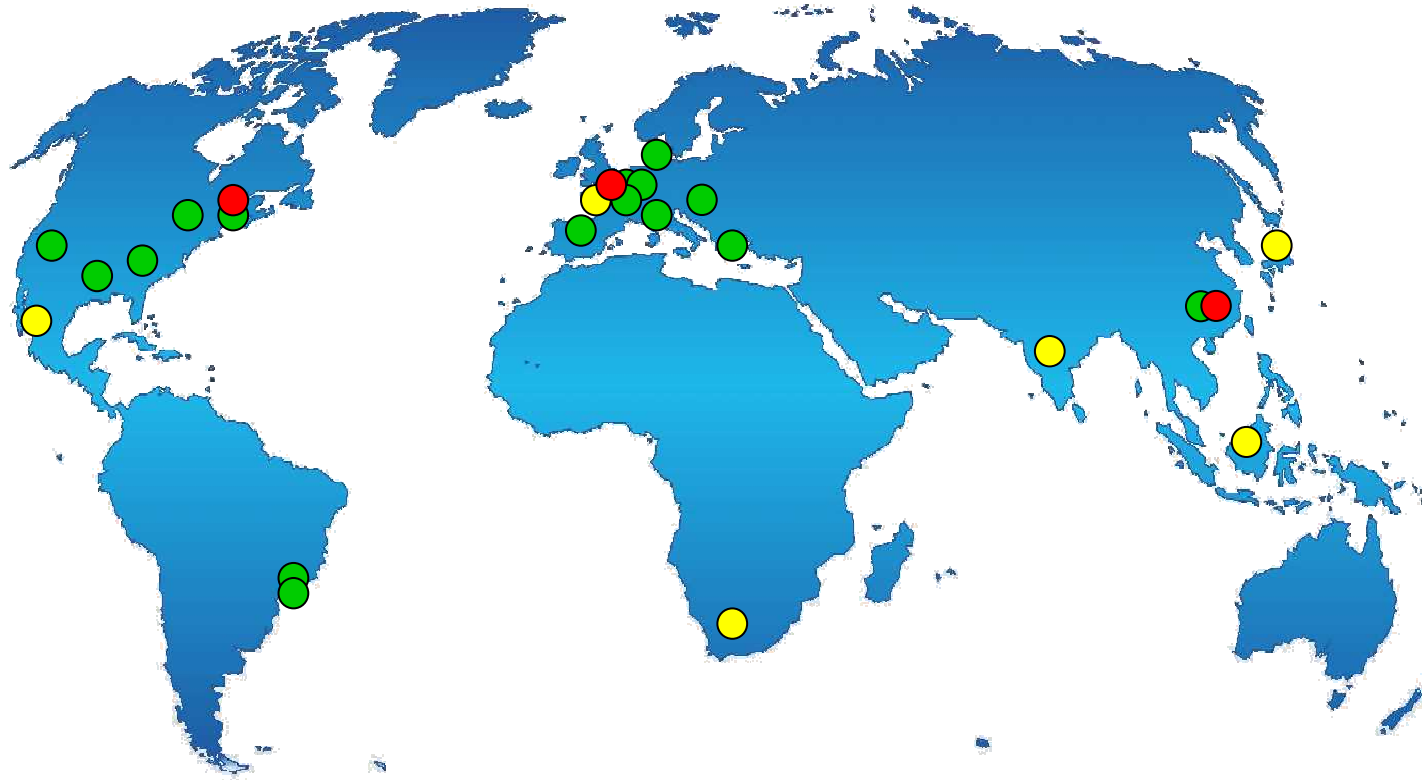


Advantages of labeling with LEXSY® LabelPrint

- With just-in-time printing of current data ...
 - the labels always comply with the latest legal requirements (hazardous substances, hazardous goods, etc.)
 - no need to procure and store preprinted labels
 - no need to dispose of outdated, invalid labels
 - label mix-ups can be avoided

- The consolidation of data on combination labels results in ...
 - reduced administration costs: only one label layout has to be created and planned
 - lower printing costs: only one label has to be printed
 - reduced handling costs: only 1 label must be applied and checked

References: LEXSY® LabelPrint installations worldwide



● Installed

- China, Caojing
- USA, Pennsylvania
- USA, Texas
- USA, Ohio
- USA, California
- USA, Georgia
- Germany, Leverkusen
- Germany, Dormagen
- Germany, Uerdingen
- Spain, Tarragona
- Denmark
- Czech Republic
- Italy
- Greece
- Belgium
- Brazil

● Server sites

- Germany, Leverkusen
- USA, Pittsburgh
- China, Caojing

● Planned

- France
- Mexico
- Africa
- Japan
- Korea
- Indonesia
- India
- etc.



Distribution/Warehousing

BAYER Warehouse Manual – Best Practice Solution

Structure of the new Bayer Warehouse Manual, internally published in 2009:

Design

- **Attributes of storage goods**
 - Classification by physical / toxicological attributes and environmental attributes (water pollution) according to **GHS**
- **Design of storages**
 - Classification of storage goods, determine correspondent quantities
 - Define safety requirements as separation of storage goods, limitation in storage volumes per fire section, design of safety concept
 - State of the art in logistics functionality / optimized material flow

Operation

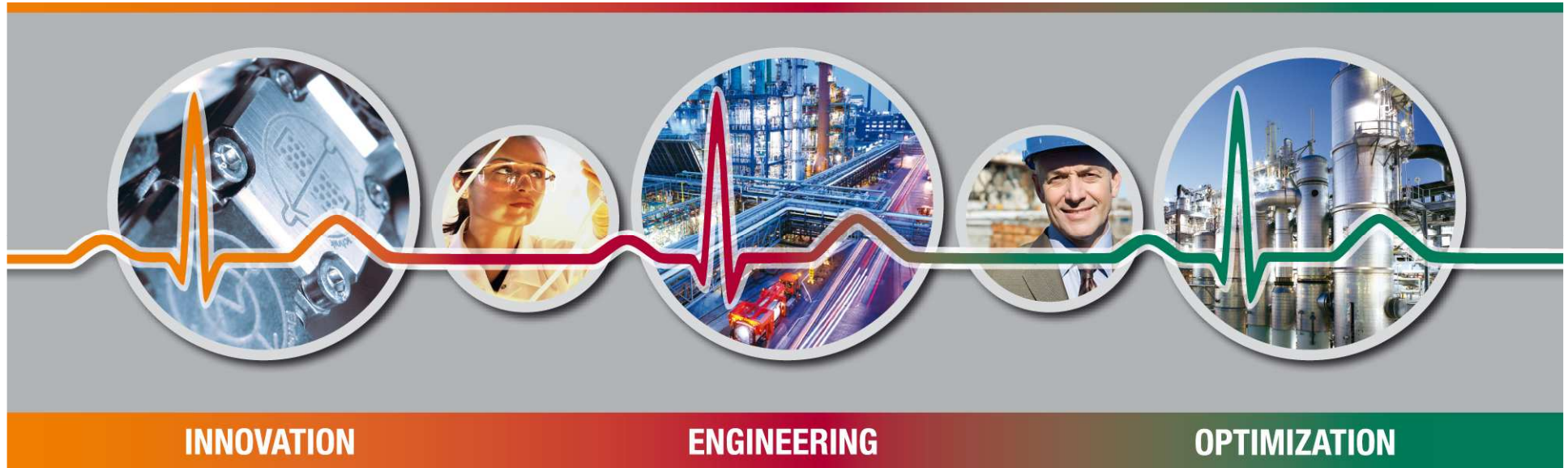
- **Check tasks and scope of the warehouse management**
- **Verify business processes of the warehouse**
- **Review warehouse security**

Audit

- **A regular auditing of the warehouse is recommended**
- **Audit topics:**
 - General information (storage goods, volumes, type of operations)
 - Legal permits
 - Warehouse type and technology
 - Fire protection and safety-relevant facilities
 - Organization / Safety Management System



Powering Your Performance



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