

# Aerosol Dispenser Prepackages



- Significance for market
- Why labeling by volume?
- Prevention of deceptive packages
- Density determination

Alexander Liebegall

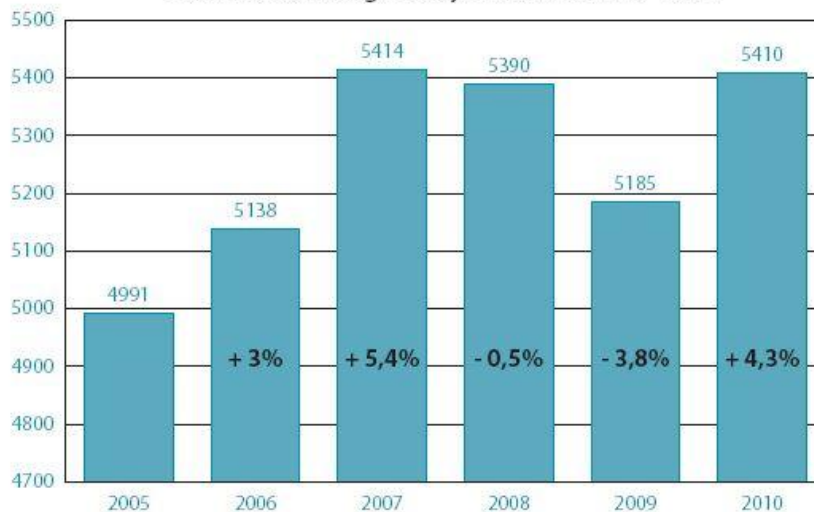
( for the part density determination a paper presentation of  
Werner Buettner and Guenter Missuweit was incorporated)

# Significance for market

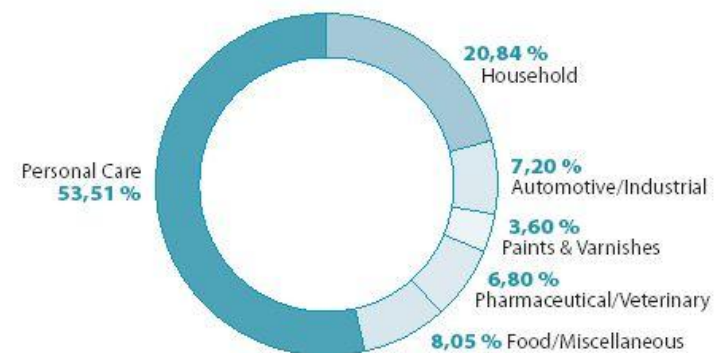
Aerosol containers are primarily made of steel and aluminium whereas glass and plastic containers remain marginal.

Cosmetics and household products represent approximately 75% of the European production. Europe is the world's largest filler with 5.4 billion produced in 2010.

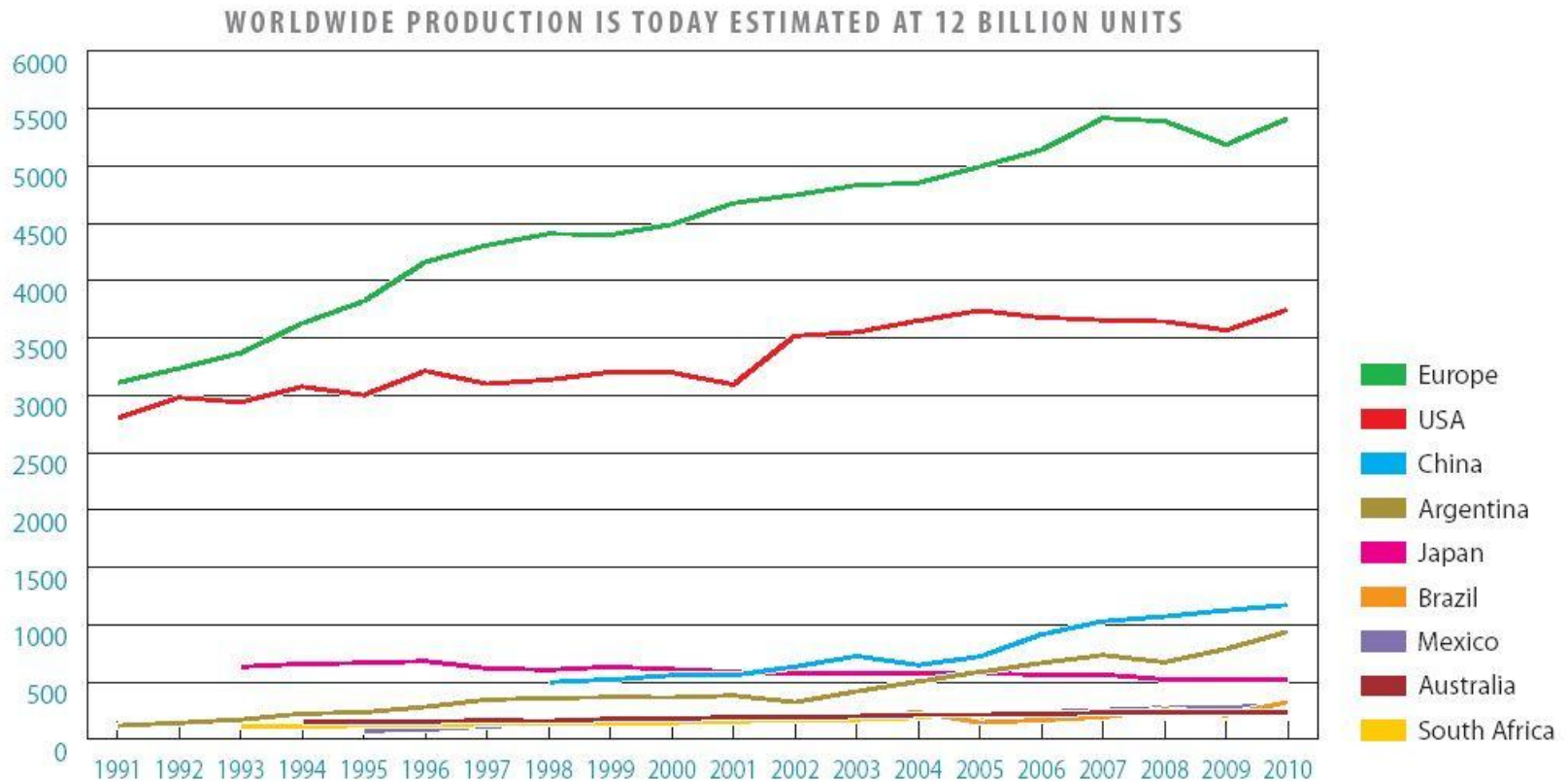
**EUROPEAN AEROSOL PRODUCTION**  
Evolution through the years in 000 000' units



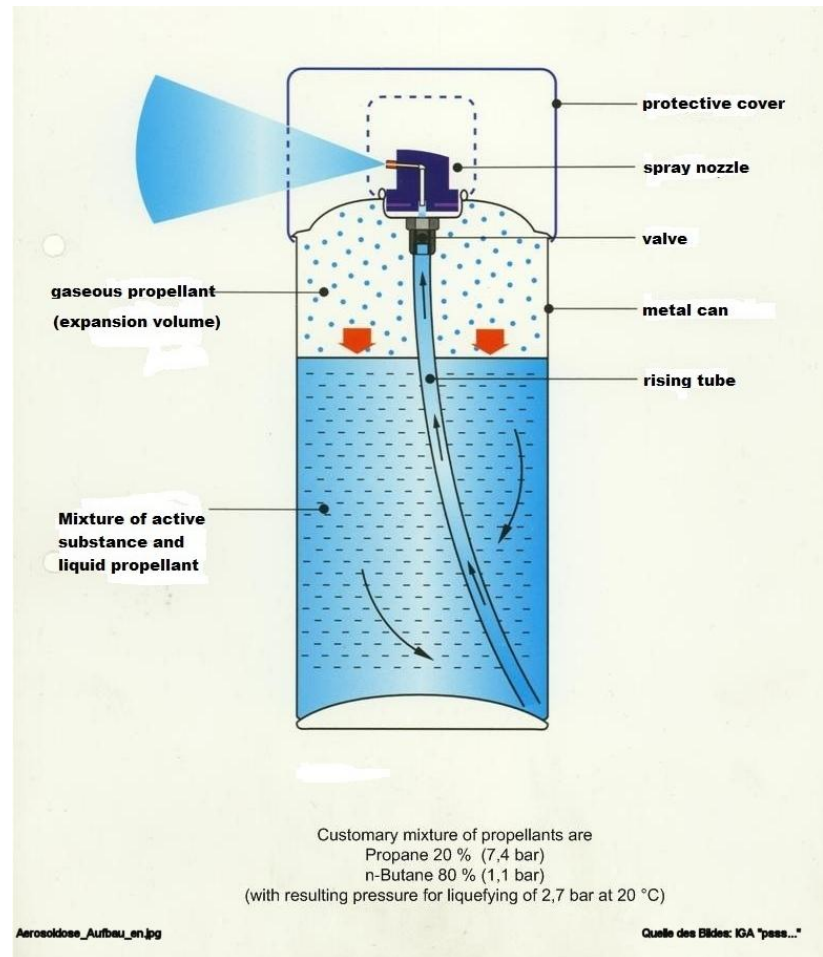
**EUROPEAN AEROSOL PRODUCTION**  
2010 Products Breakdown



# Significance for market



# Aerosol Dispenser - General structure



# Why labelling by volume? - Reasons

## Density of

- pigments and of
- propellants

are very different!

For the use, the volume is the crucial variable

e.g.: For paintings the area multiplied with the thickness is a volume and not a mass.

# Why labelling by volume? - Pigments

## Dispensers with different colours of paint:

Colour	Density in g / ml	300 g are
green	0,767	391 ml
white	0,748	401 ml
pink	0,705	426 ml
yellow	0,689	435 ml
yellow	1,344	223 ml

# Why labelling by volume? - Propellant

## Dispensers with different propellants

Propellant	Density in g / ml at 21 °C	300 g are
Propane	0,50	600 ml
Butane	0,58	517 ml

# Why labelling by volume? - EU directives



- Directive **75/324/EEC** on the approximation of the laws of the Member States relating to aerosol dispensers  
Article 8(1)(e): Each aerosol dispenser ... must bear ... the net content by weight and **by volume**.

but

- Directive **2007/45/EC** Article 4:
1. Aerosol dispensers shall indicate the nominal total capacity of the container. The indication shall be such as not to create confusion with the nominal volume of the contents.
  2. Products which are sold in aerosol dispensers need **not** be marked with the nominal **weight** of their contents.  
(by way of derogation from Article 8(1)(e) of Directive 75/324/EEC)



# Why labelling by volume?

## - What is the volume?

Directive 75/324/EEC Annex No. 1.6 and so also  
German Prepackages Regulation (FPV) § 7 (1) :

**Indication of nominal volume and nominal total capacity**  
– Nominal volume should be stated in the liquid phase:  
"Volume of liquid phase" means the volume of the non-gaseous phases in the filled and closed aerosol dispenser.

**i.e.**

**mixture of active substance and liquid propellant**

# Prevention of deceptive packages

Security reasons because of high pressure compartments:

Directive 75/324/EEC Annex

→ 3.1.2. *Filling*

At 50° C, the pressure in the aerosol dispenser must not exceed 12 bars, whatever kind of gas is used for filling.

→ 3.1.3. *Volume of the liquid phase*

The volume of the liquid phase at 50° C **must not exceed 87 %** of the net capacity. However, for containers with a concave base which becomes convex before bursting, the volume of the liquid phase at 50° C may be as much as 95 % of the net capacity.

# Prevention of deceptive packages

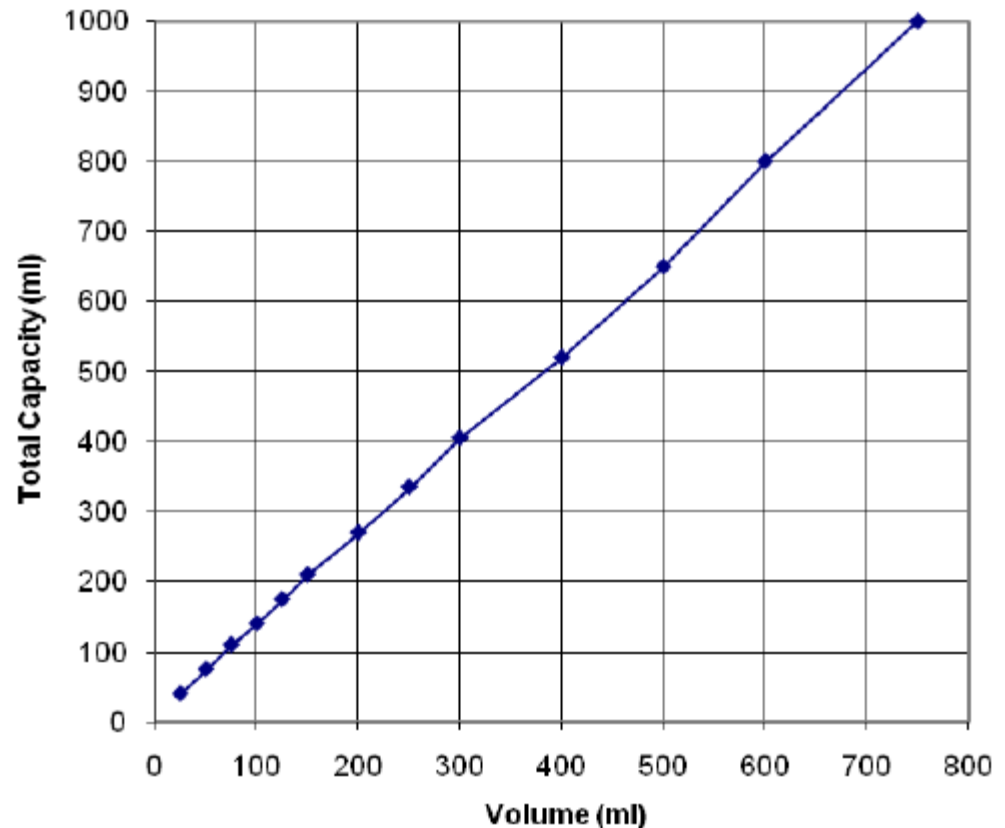
## Filling levels

- Percentage (grade) of fill by volume / maximum container capacity according to singular volumes by OIML R 87:2004 Annex E.3, table E.1 which was taken from 80/232/EEC and by interpolation for all volumes by European Aerosol Federation FEA 422 E March 2008

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- DIRECTIVE 94/62/EC on **packaging and packaging waste** Article 1 paragraph 2: To this end this Directive lays down measures aimed, as a first priority, at preventing the production of packaging waste and, as additional fundamental principles, at reusing packaging, at recycling and other forms of recovering packaging waste and, hence, at reducing the final disposal of such waste.

- **Sustainability**



# Prevention of deceptive packages

## Percentage filling level depends on container capacity

→ Volume for valve and rising tube is nearly constant. Therefore no constant factor is possible for filling ratio.

Excerpt from 80/232/EEC - OIML R 87:2004 Annex E.3, table E.1 :

Volume of the liquid phase in ml	Container capacities for products propelled by liquid gas in ml	Volume of the liquid phase / container volume in %
25	40	<b>63</b>
50	75	<b>67</b>
75	110	<b>68</b>
100	140	<b>71</b>
200	270	<b>74</b>
250	335	<b>75</b>
500	650	<b>77</b>
750	1000	<b>75</b>

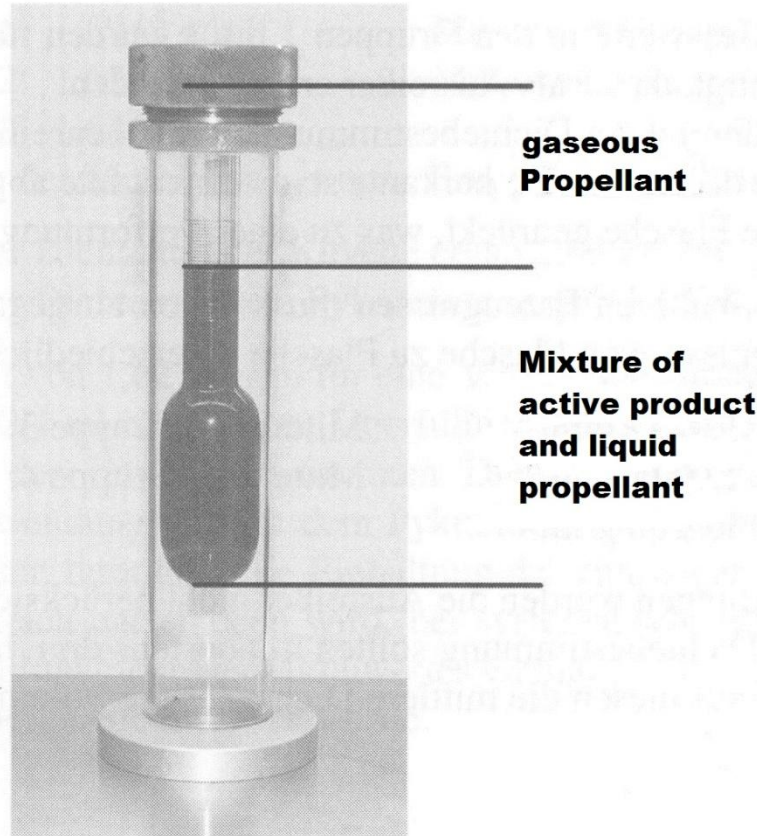
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750 ml: Preiserhöhung um 19 %, wenn statt 75 % nur 63 % (bei gleichem Dosenpreis)

# Methods for density determination

- Pressure-tight glass pycnometer (preferred procedure)
- Digital density meter with oscillating U-tube sensor and with aerosol dispenser adapter (hair sprays, insecticide sprays, cleaning sprays)
- Calculation from the densities of used material, if measurement can not be applied (e.g. polyurethane foam)
- Additional procedure: **X-ray method**
  - appropriate method for all products
  - expensive equipment
  - reference method
- Expanded error limits for density determination of aerosols:  
     $\pm 1 \%$  (German RFP No. 9.4.13.1)

# Pressure-tight glass pycnometer



# Digital density meter with oscillating U-tube sensor and with aerosol dispenser adapter





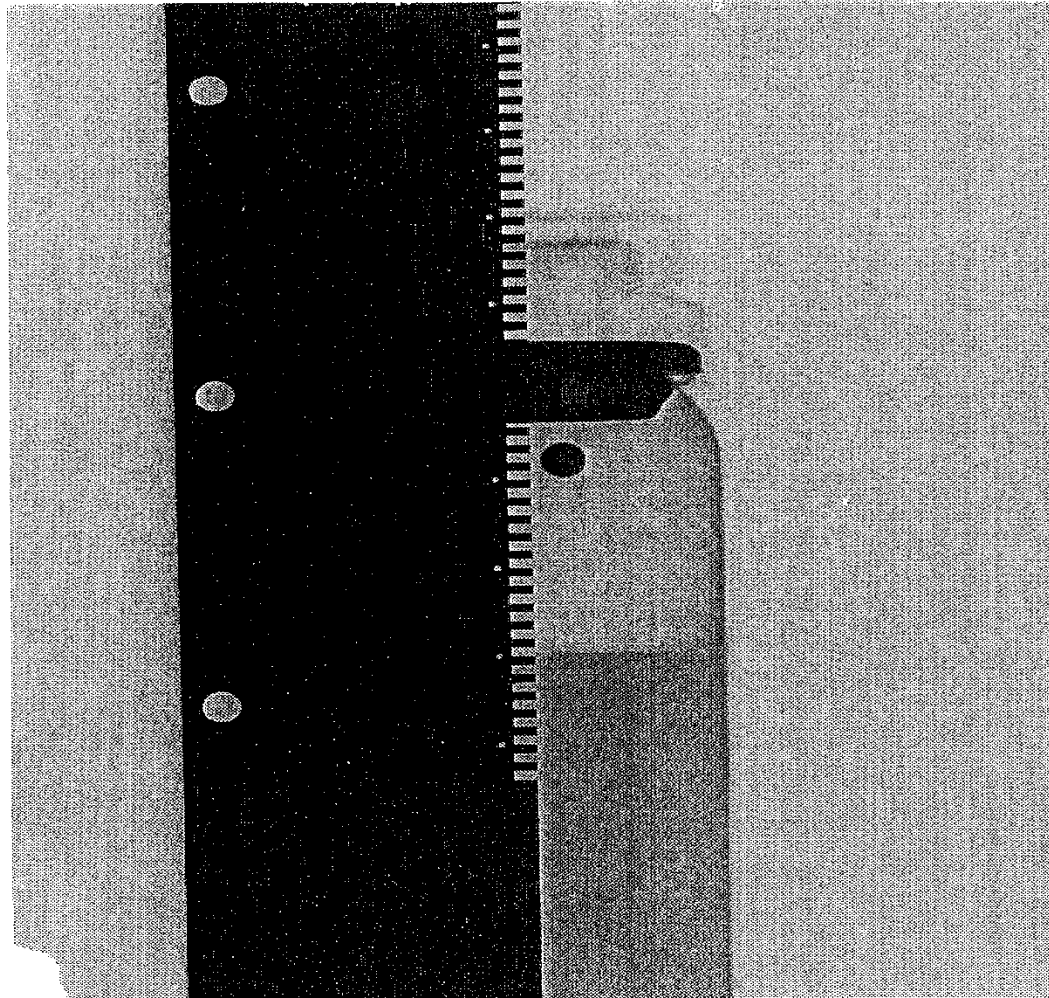
# X-ray device





# X-ray method

## Picture to determine the filling height



# Density determination - Literature -

- Procedures for the determination of aerosol density according to Number 9.4.13 of German Guidance for metrological control on prepackages (Richtlinie zur Füllmengenprüfung von Fertigpackungen und Prüfung von Maßbehältnissen durch die zuständigen Behörden - RFP) (only in German)
- Guide OIML G14 (Edition 2011) „Density measurement“  
*very small information for aerosols*
- *OIML Bulletin No 96 Sept 1984 pp. 3 – 9 by J. Ruessing*
- „Dichtebestimmung von flüssigen, pastösen und pulverigen Erzeugnissen“ ISBN: 978-3-89947-445-9  
Authors: Thomas Schade, Hans Luy  
*very detailed informations also for the determination of aerosol density* (only in German)