PVC in a sustainable Future
3rd February 2010

H. Leitner

PVC and sustainability

- The Global contexte
- Our activity towards sustainability –
- Hence a low carbon futur
- Is concentrated in Vinyl 2010
- Will be the driver for Vinyl 2020

Contents

- **Brief history of the “PVC issue”**
- How far has the PVC industry progressed on the way to sustainability?
- Some current global sustainability issues relevant for PVC
  - What can PVC contribute to meet those challenges?
- A look at the future

the global context

- Issues, threats and opportunities are getting more and more similar globally
- Key issues and threats
  - Additives, green building, green labelling, packaging, de-selection
- Opportunities
  - Long life applications
  - Climate protection
  - Clean water supply and sanitation
  - Recycling as an element of sustainability
  - Willingness of the PVC industry to engage the whole supply chain in good practices

Key Asian (APVN) issues: Pipes

- PVC under pressure in India, Malaysia, Philippines due to bad quality pipes tarnishing the image of PVC
  - In India, PVC pipes not preferred in urban areas due to fear of damage, load concern and cheaper alternatives, e.g. stoneware
- Strong pressure from competition (polyolefins), via
  - Standardisation
  - (Eco-) labelling
  - Technical studies
- But PVC active as well
  - Quality certification
  - Dissemination of technical information
  - Emphasis on recycling (Australia, Japan)
  - Emphasis on PVC technical strengths
    - Resistance to gasoline permeation
    - Resistance to water treated with chlorine dioxide

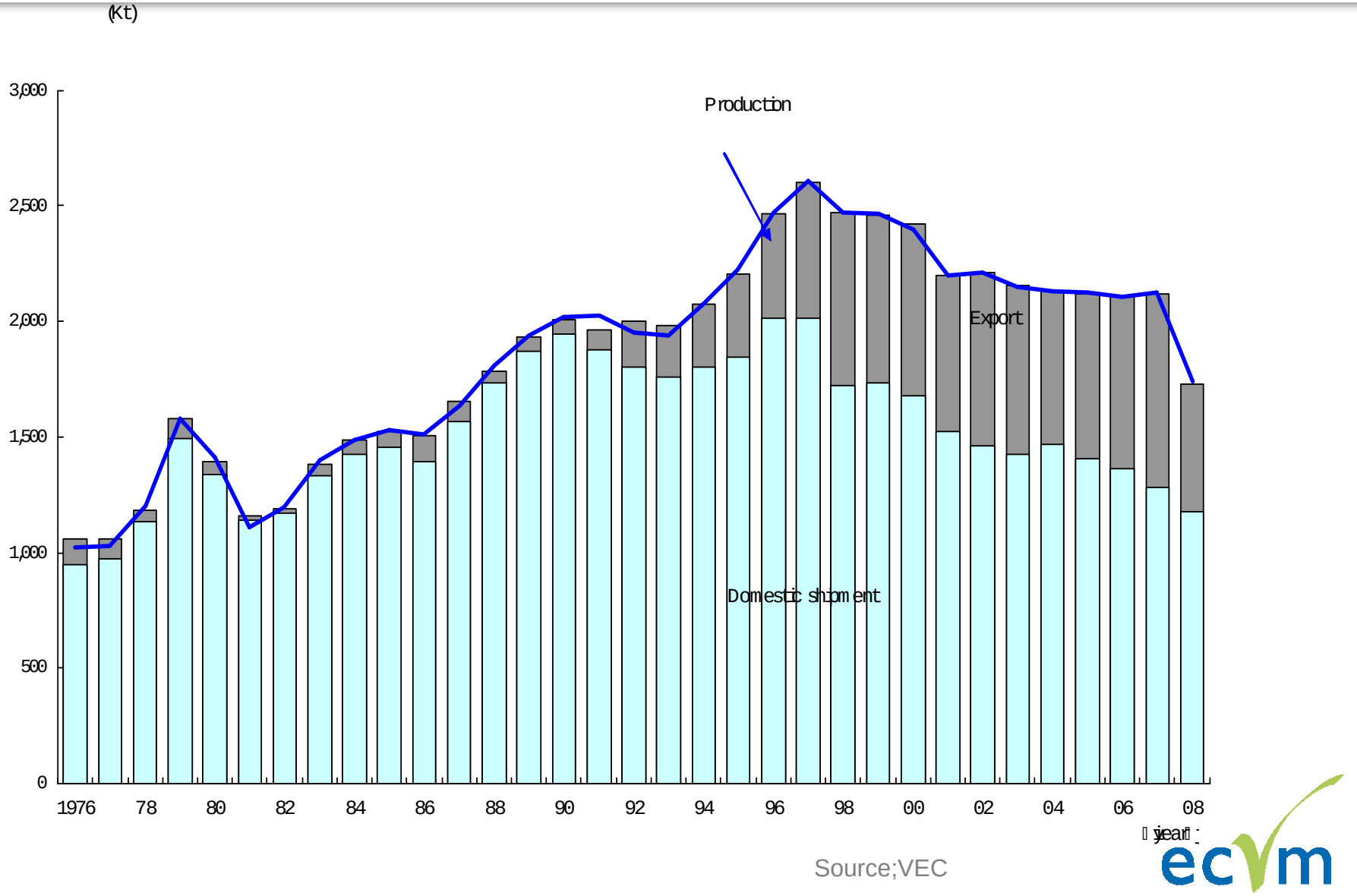
Key APVN issues: Green Building & Procurement

- Asia fastest growing market for green building
  - More than half of world's urban population will live in Asia-Pacific by 2030
- Increasing influence of Green Building Councils
  - In 2008, GBCs existed in Australia, China, India, Japan, Korea, Now Zealand, Philippines, Taiwan
  - In 2009 GBCs launched in Indonesia, Malaysia, Vietnam and Thailand
  - Some anti-PVC positions by the Philippines, Singapore GBCs
  - Australia's and New Zealand's GBCs have adopted Green Star with negative PVC credits, but hopes this may change in Australia by 2010
    - Australia may replace by a positive rating for using 'best practice' PVC
- Ecolabels
  - Thailand discriminating PVC pipes in favour of PE
  - Korean eco-labels restricting "halogenated synthetic resins"

GVC issues and developments: USA - Markets

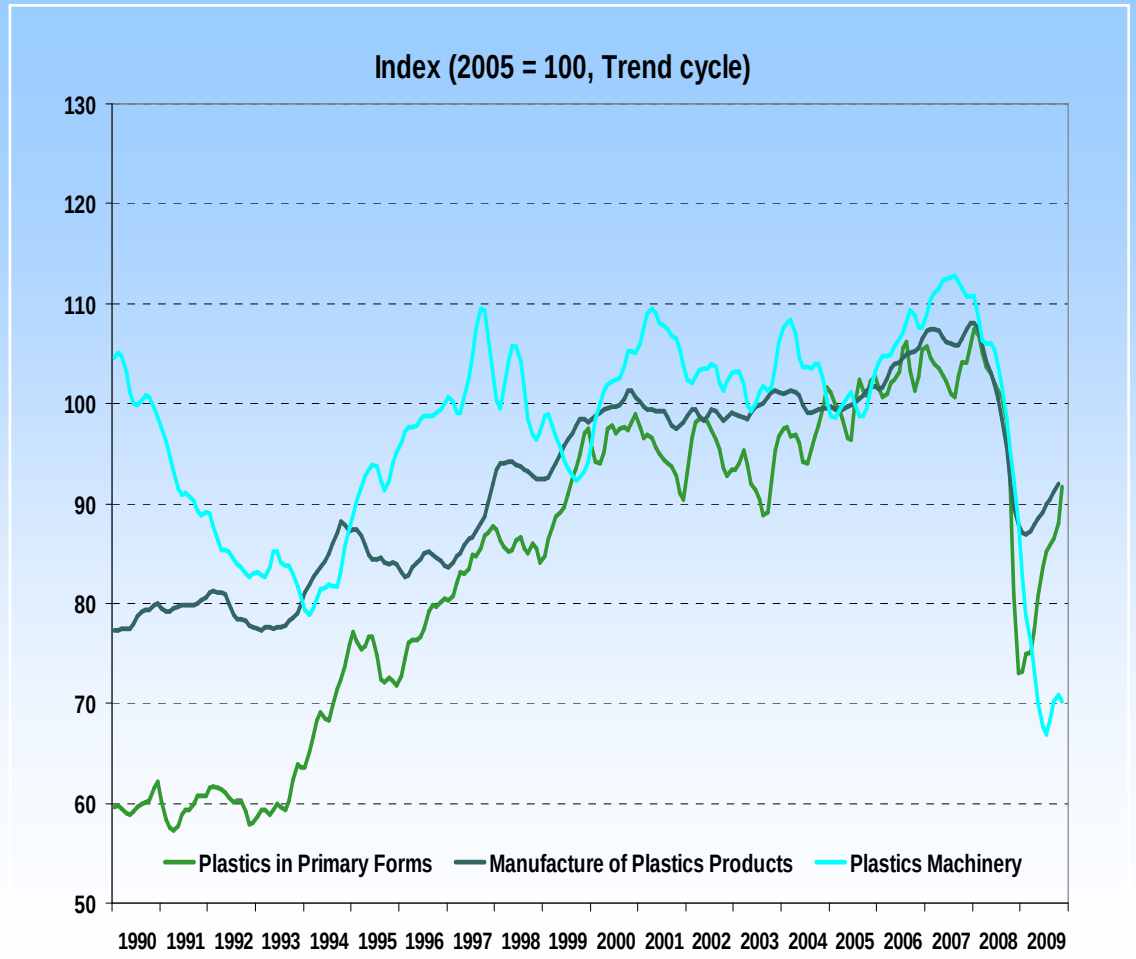
- US PVC production in 2008
  - 5.8 Mt; 11.5% ⇩ from 2007
  - 75% capacity utilization
- Same levels expected for 2009
- PVC resin exports posted a record year in 2008, up 27.4% over 2007. Trend has continued in 2009 due to low price for natural gas
- Collapse in caustic soda prices in 2009 vs. 2008
  - From ~ $1,000 per dry metric ton down to $25 (spot market)
- Outlook
  - PVC market in U.S. will resume growth when construction market improves (60% of PVC products)
  - Profit margin squeeze will continue in 2009
  - Good News! Other products not taking market share. PVC performs – will continue to be used.

PVC Production & Shipments in Japan



Source;VEC

European Union (EU27)
Plastics Industry Production



- EU27 Plastics Industry has started to recover from the considerable reduction in economic activity that took place during the winter half year 2008/2009. However, the upturn is proceeding with different strength
- The recovery with Primary Plastics, starting earliest, has strengthened in November 2009
- Plastics Products show a slight recovery since mid 2009, which has continued in November 2009
- The deep fall in production of Plastics' Machineries has come to an end. The slightly increasing production trend, however, which was first visible in September, has not continued in November 2009

Source: Eurostat / PlasticsEurope Market Research Group (PEMRG)

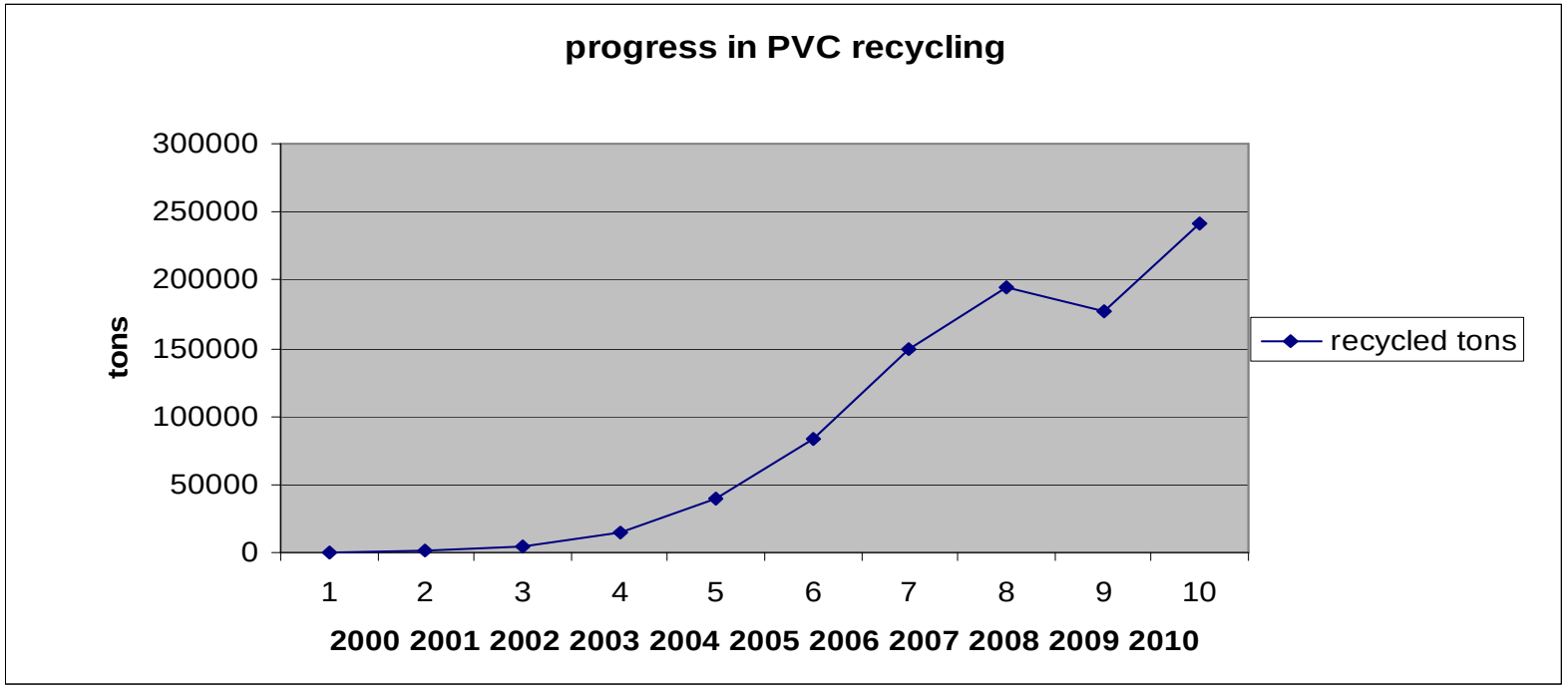
The Vinyl 2010 commitments

- Recycling 200,000 tons of post consumer PVC waste by 2010 (In addition to volumes recycled in 2000, excluding regulated waste streams)
- Progressive replacement of lead stabilisers:
  - Minus 15 % in 2005 (compared to 2000)
  - Minus 50 % in 2010 (compared to 2000)
  - Total phase out by 2015
- Stop using cadmium stabilisers in 2001
- Completion of risk assessments of phthalates
- Compliance with ECVM charters for PVC production
- Implementation of social charter

Key Vinyl 2010 achievements 2000-2008

- PVC recycling reaches 194,950 tonnes (‘08) 182 kt in 2009
- 50% lead stabiliser replacement achieved (‘08) 65% in 2009
- Environmental Declarations for S-PVC & E-PVC published (‘07)
- Cadmium stabilisers phased-out (EU-15 ‘01, EU-25 ‘06, EU-27 ‘07)
- Phthalate risk assessments completed (‘05-’06) published (‘06-’08)
- Risk assessment on lead stabilisers published (‘05)
- Registration of Vinyl 2010 as a Partnership with the Secretariat of the UN Commission on Sustainable Development (‘04)
- Bisphenol A phased out of PVC resin production (‘01)

PVC recycling

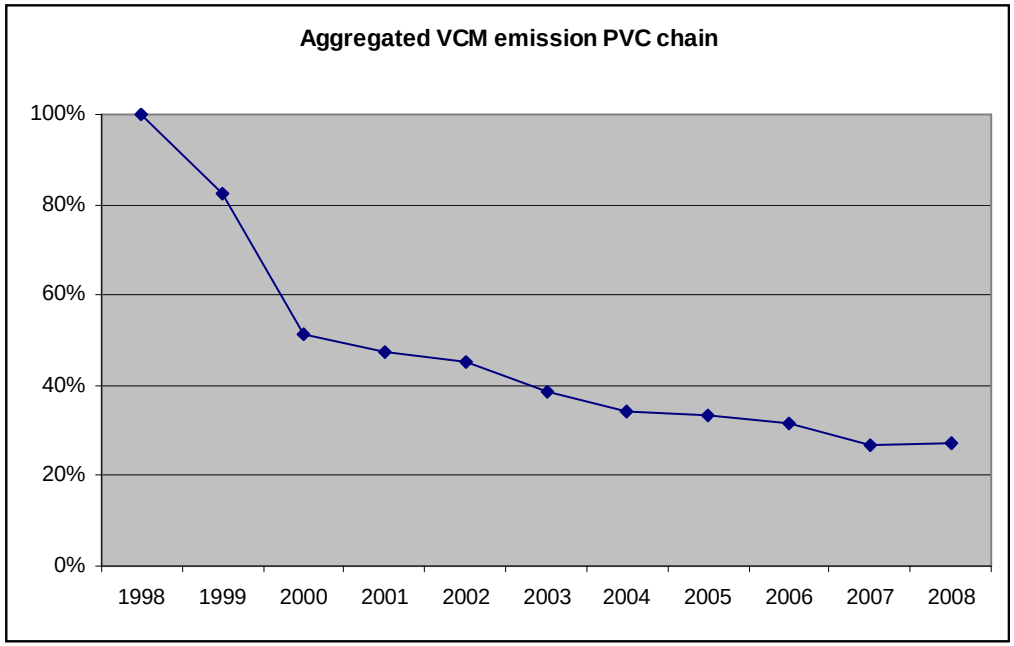


More voluntary industry actions

- Work with The Natural Step
  - Non-profit, international organisation, using a set of scientifically proven sustainability principles to transform debate into useful discussion and to drive innovation
  - TNS identified 5 “system conditions” that the PVC industry should fulfill
- Cooperation with UK stakeholders
  - PVC industry, retailers and NGOs
  - PVC Co-ordination Group, chaired by Jonathon Porritt, Chairman of the UK Sustainable Development Commission and Programme Director of Forum for the Future
  - “U.K. Eco-efficiency Code of Practice for the Manufacture of Suspension PVC” (March 2000).

PVC manufacturing in 2008

- External verification of ECVM S-PVC and E-PVC production charters (2002 and 2005)
- Final verification in 2010
- Impressive reduction of emissions
- No major sustainability issue

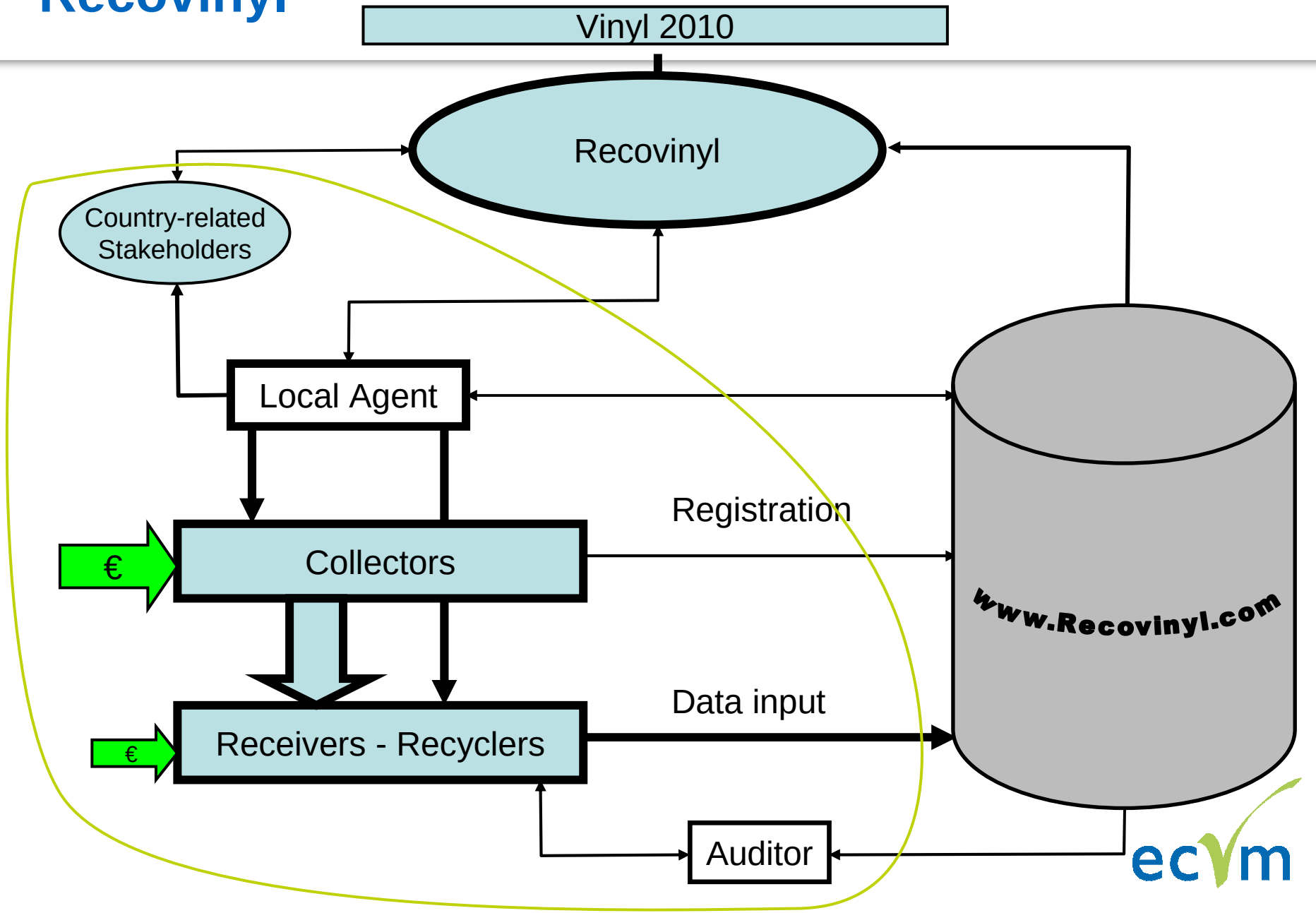


Stabilisers EU 15 + Norway, Switzerland & Turkey

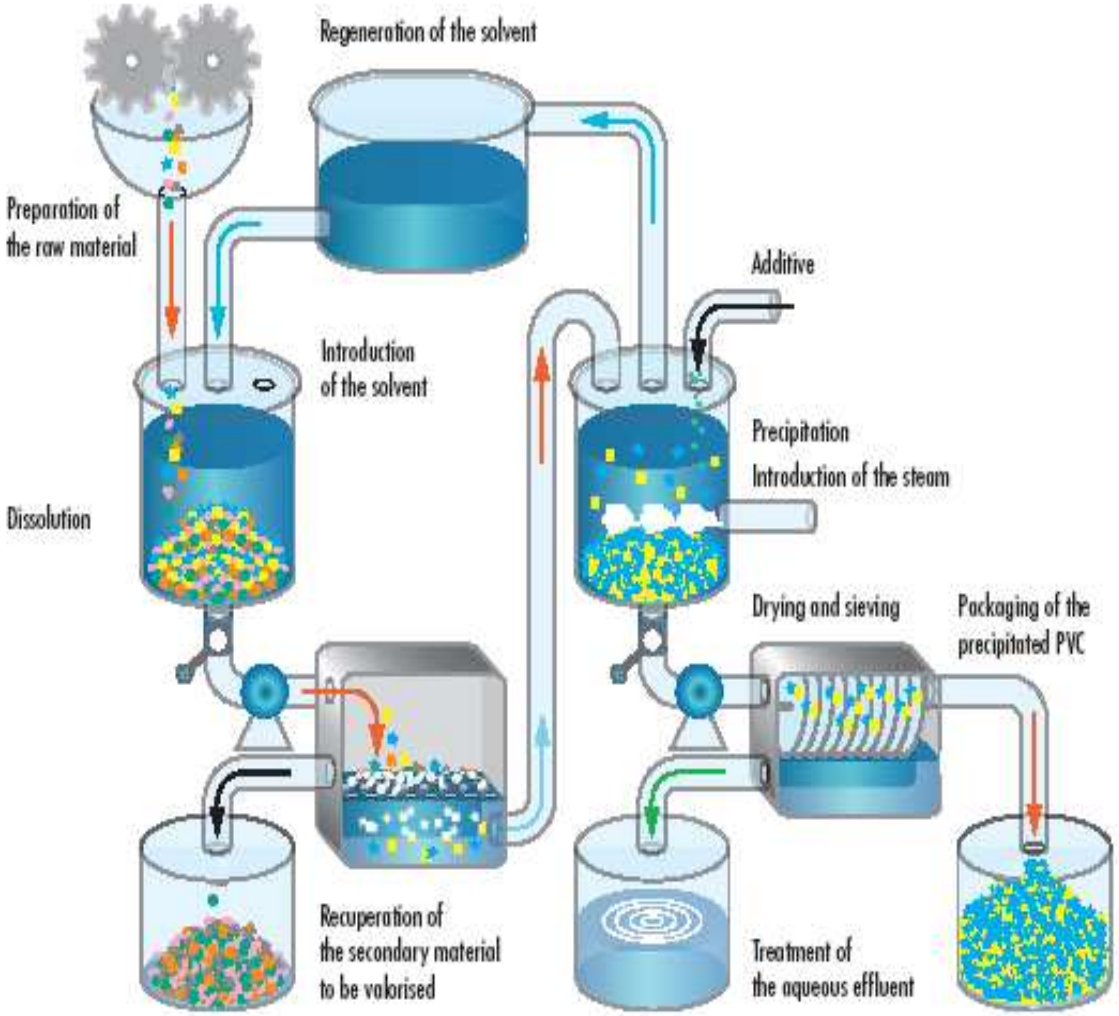
Tonnes of Stabiliser Systems	2000	2008	Reduction (%)
Formulated lead stabilisers	**127,156**	**60,604**	**52.3**

Tonnes of Stabiliser Systems	2000	2008
Formulated calcium organic stabilisers e.g. Ca/Zn systems	**17,579**	**68,458**
Tin stabilisers	**14,666**	**13,280**
Liquid stabilisers – Ba/Zn or Ca/Zn	**16,709**	**16,523**

Recovinyl

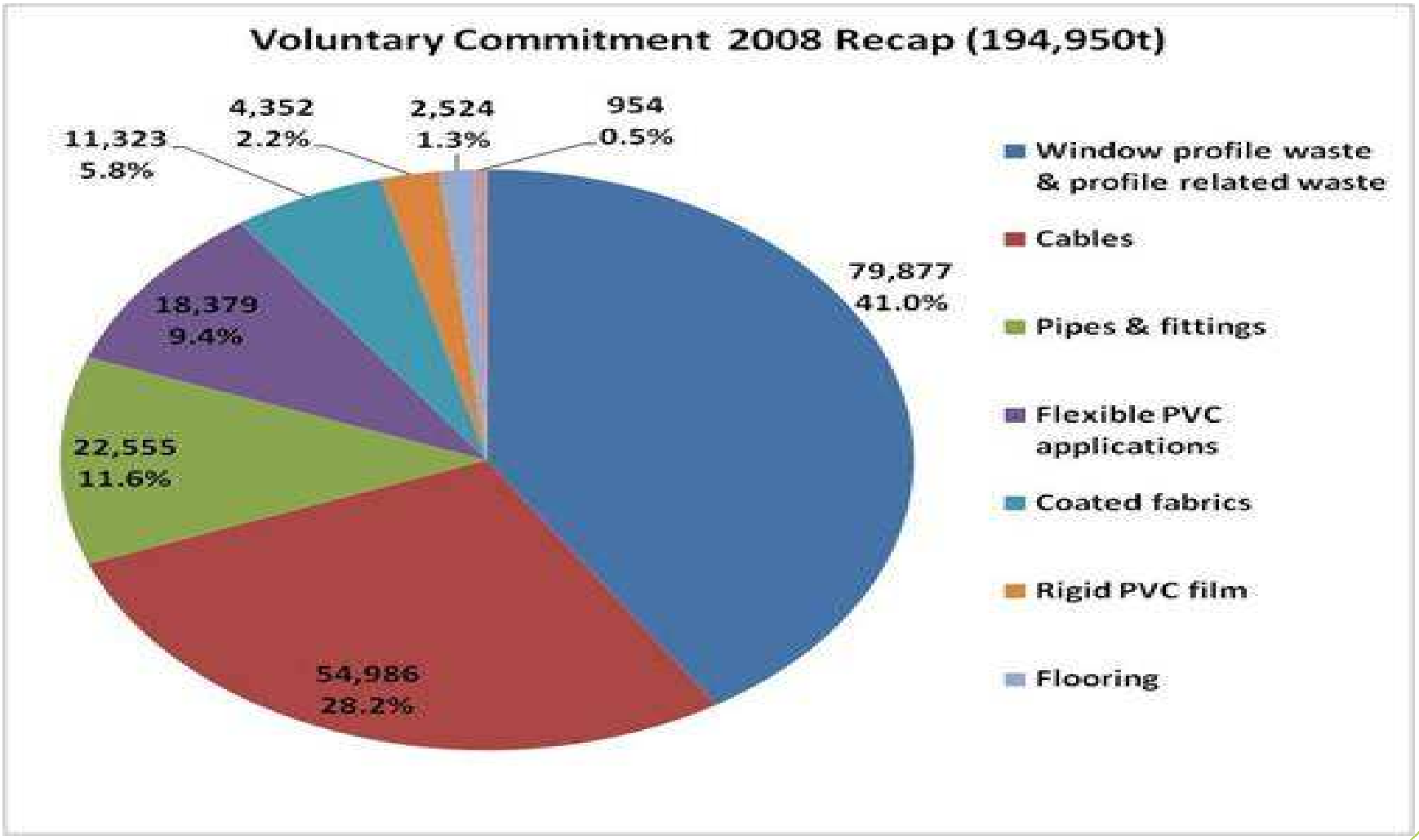

Vinyl 2010
Recovinyl
Country-related Stakeholders
Local Agent
Registration
€
Collectors
www.Recovinyl.com
Data input
€
Receivers - Recyclers
Auditor
ecvm

The Vinyloop process

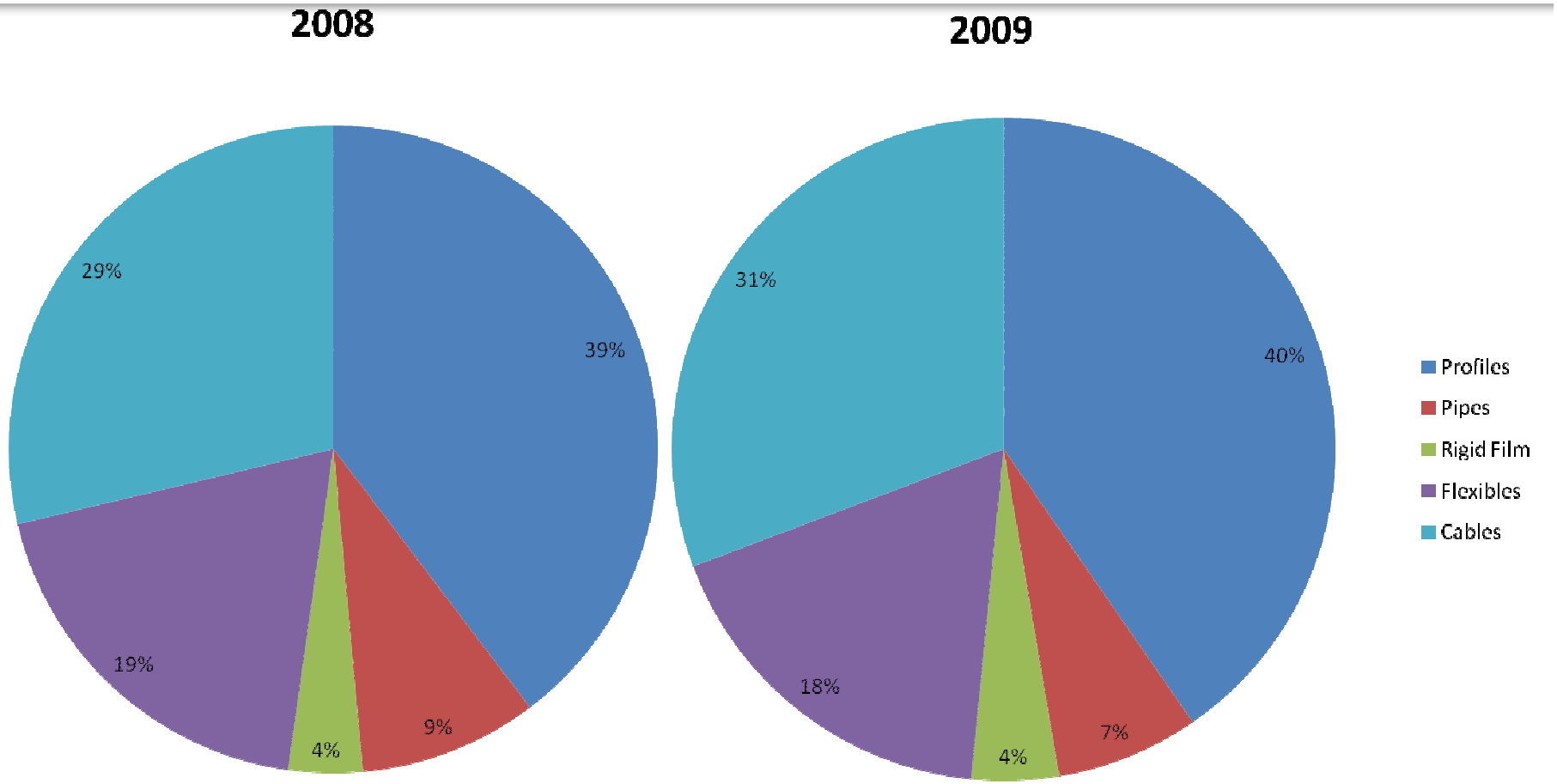


- Preparation of the raw material (waste)
- Dissolution
- Filtration
- Precipitation
- Drying and post treatment

Vinyl 2010 recycling near to target



Overview 2008 versus 2009 by application



Recovinyl achievements

Recycled Volumes registered by Recovinyl, per Application (tonnes)

	Year 2007	Year 2008
Rigid PVC Applications		
Pipes	**18,375**	**22,495**
Profiles	**39,517**	**79,600**
Rigid Films	**2,134**	**4,352**
Total Rigid PVC Applications	60,026	106,447
Flexible PVC Applications		
Cables	**37,469**	**54,986**
Mixed	**13,827**	**29,959**
Total Flexible PVC Applications	51,296	84,945

Situation by country

Countries	Outlook 2009		Draft 2010	
	Ton	€/t	Ton	€/t
Bel/Lux	4700	44	4700	44
France	11000	35	18000	28
Germany	69600	17	85000	17
Italy	15500	22	19700	20
The Netherlands	11300	32	13000	29
United Kingdom	31500	21	49300	19
Austria	3400	24	4000	21
Denmark	2500	98	4600	52
Portugal	1000	36	1200	32
Spain	9000	21	12000	22
Czech	12300	17	17000	16
Slovakia	700	19	1000	24
Hungary	500	28	1000	20
Poland	7000	24	8500	23
Sweden	-	-	1000	12
Sub total	180000	23	240000	21

What are the basics

- An established waste management system is necessary to get to high tonnages
- Legislation (eg Germany) helps
- In some countries collectors/recyclers are very reluctant to audits (Italy, Poland...)
- But audits are mandatory

What are the basics

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The finances and sustainability

- We have permanently reduced the incentives and are now at 22 €/t
- Target is self sustainability
- Here we need a pull approach
- By creating a value for an article containing recylate
- And it is linked to the virgin price

The Halosep ® process

- Recovers 98-99 % of the chlorine from incineration flue gas waste residues in the form of salts
- Reduces by 50–75 % the amount of neutralisation waste to be disposed to landfills and improves its leaching properties
- The treated waste complies with the leaching limit criteria for heavy metals for non-hazardous waste
- The main product is a salt brine free from dioxins, furans and heavy metals
- Cadmium, zinc and lead can be extracted in various amounts

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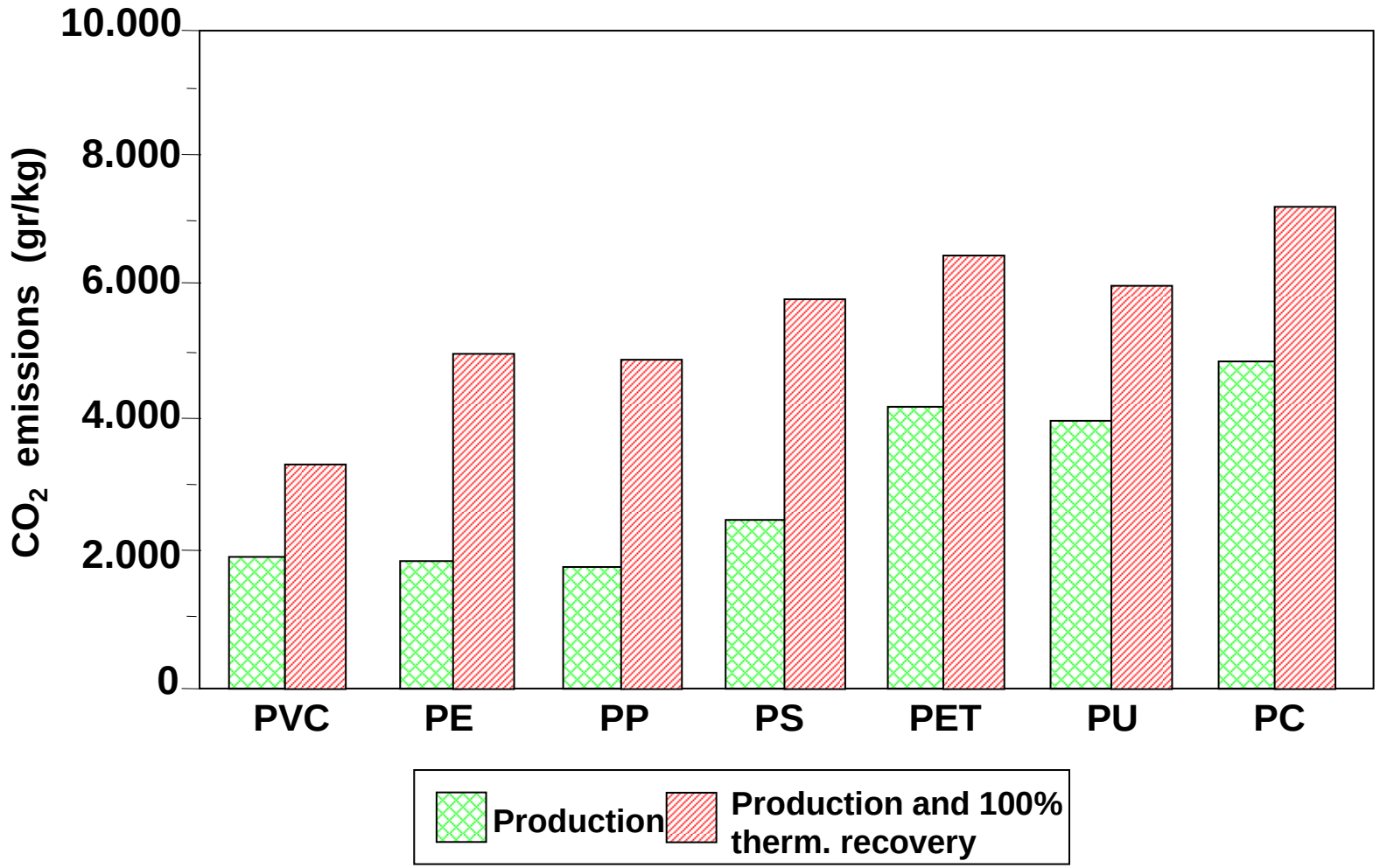
Some current global sustainability issues – PVC solutions

- Climate change
  - Greenhouse gases emissions
    - CO2 emission avoidance
      - Use less non-renewable energy
        - » Save resources at production level
        - » Save energy consumption during use
        - » Recycle
- Potable water supply, sanitation
  - PVC piping systems: cost effective and reliable
- Pollution and waste management in developing countries
  - Disseminate good practices
- “Dangerous chemicals” in products
  - Risk assessments, voluntary phase-outs

Contribution of PVC as material

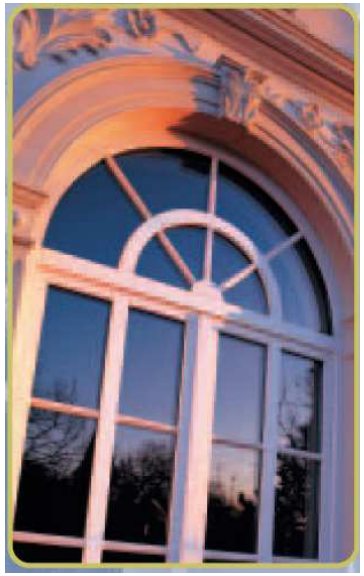
- Efficient manufacturing
- 43% oil / 57 % chlorine
  - But chlorine production is energy intensive
    - Chlorine from incineration in future?
    - But then, what about caustic?
- Sources of carbon
  - Fossil
  - Recovery: syngas, recycled material
  - Renewable (e.g. sugar cane)
    - Long term move of the industry to countries producing the agricultural raw materials?
    - Second generation likely to be derived from cellulose

PVC good in ecological key issues! Source : Vinnolit e.g. CO_2 emissions



PVC products: importance of the use phase

- Very significant impact of lifetime (durability)
- Windows
  - Huge energy savings
- Flooring
  - Primary energy consumption for cleaning is ¾ of the energy spent in manufacturing
- Pipes
  - Impact of water leakage
  - Smoothness reduces pumping energy



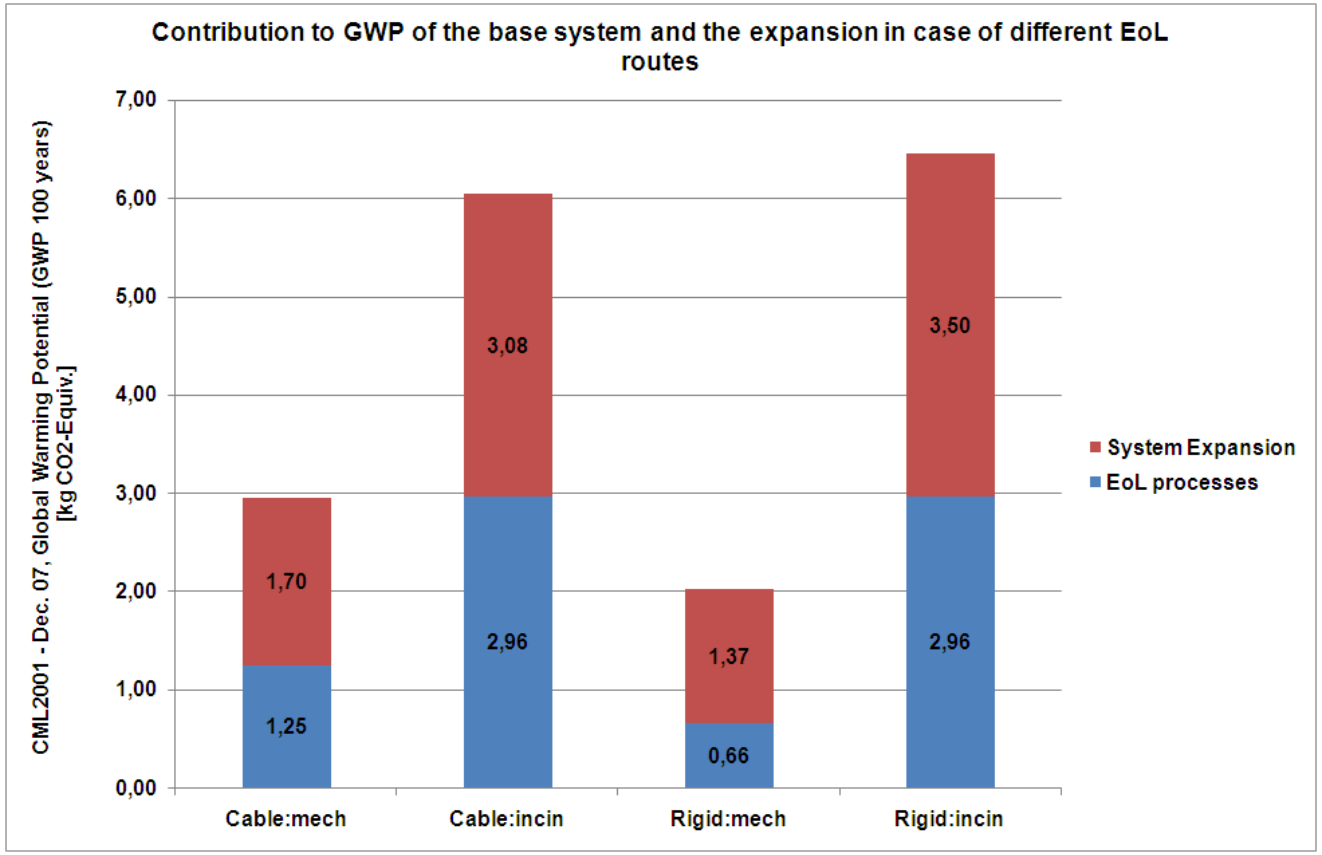
ecvm

PVC products: impact of end-of-life phase

- Recycling reduces very significantly resources consumption and impacts of raw materials production, provided
  - Waste collection, cleaning, sorting and recycling are eco-efficient
  - 1 kg of recycled material replaces 1 kg of virgin material
- If recycling not eco-efficient, energy recovery is an option to be considered
- Landfill is the worst option from an environmental point of view

Global Warming potential reduction through recycling

- Recent study by PE International
- The figure depicts the results in terms of GWP
- **The diagram clearly demonstrates that incineration carries much higher burdens (3-4kg CO2-eq.) than mechanical recycling**
- "System expansion" refers to the inclusion of new production of PVC with additives (which are different for cable and rigid PVC)



Experience of the PVC industry: How to make voluntary commitments work?

- The strengths of the Vinyl 2010 commitment derive from:
  - Working as a united value chain
  - A set of measurable targets with clear deadlines
  - A structured financing and management system
  - Independent monitoring
  - Regular reporting and transparency
- Useful learning for any similar undertaking.

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What about the next ten years?

- Avoidance of greenhouse gas emissions and energy efficiency at the top of the agenda
  - Recycling major contributor
- Removing barriers to recycling
  - Market pull
  - Solve regulatory and standardisation issues
  - Image of products containing recyclate
- Global effort on additives
- Maintaining value chain approach
- **Consistency with TNS framework**

- No more carbon to atmosphere
- Controlled-loop recycling
- No accumulation from emissions
- Sustainable additives
- Engaging the whole value chain

Key challenges until end 2010

- Solve the regulatory issue about PVC waste containing cadmium (discussions ongoing with the EU Commission)
- Develop recycling and recovery processes for contaminated PVC waste and PVC waste mixed with plastic waste
- Find / Develop new outlets for recycled PVC waste
- Ensure financial sustainability of all collection / recycling schemes (pull effect)

Conclusion

- PVC: less carbon
- PVC: cost effective
- PVC: recyclable – and increasingly recycled!
- PVC industry: commitment to sustainable development. Ongoing actions
- **PVC industry: one step ahead**
- **Still a lot to do, but confidence!**

What is the long term view

- A carbon neutral PVC !
- What could be the milestones there ?
- An improved use of recyclates
- -20 % of CO2 reductions from the chain by 2020 ?
- Or even more ????
- Virgin production based on renewables (eg Brazil today)

ecvm represents the European PVC resin producing companies and is a division of PlasticsEurope. Its membership includes the 14 European PVC resin producers which together account for 100 % of EU 27 production. ECVM is also a leading partner of Vinyl 2010 - the organisation implementing the Voluntary Commitment of the PVC Industry - together with ESPA - representing the stabiliser producers, ECPI - representing the plasticiser producers and EuPC - representing the PVC converters.

VINYL 2010

PlasticsEurope