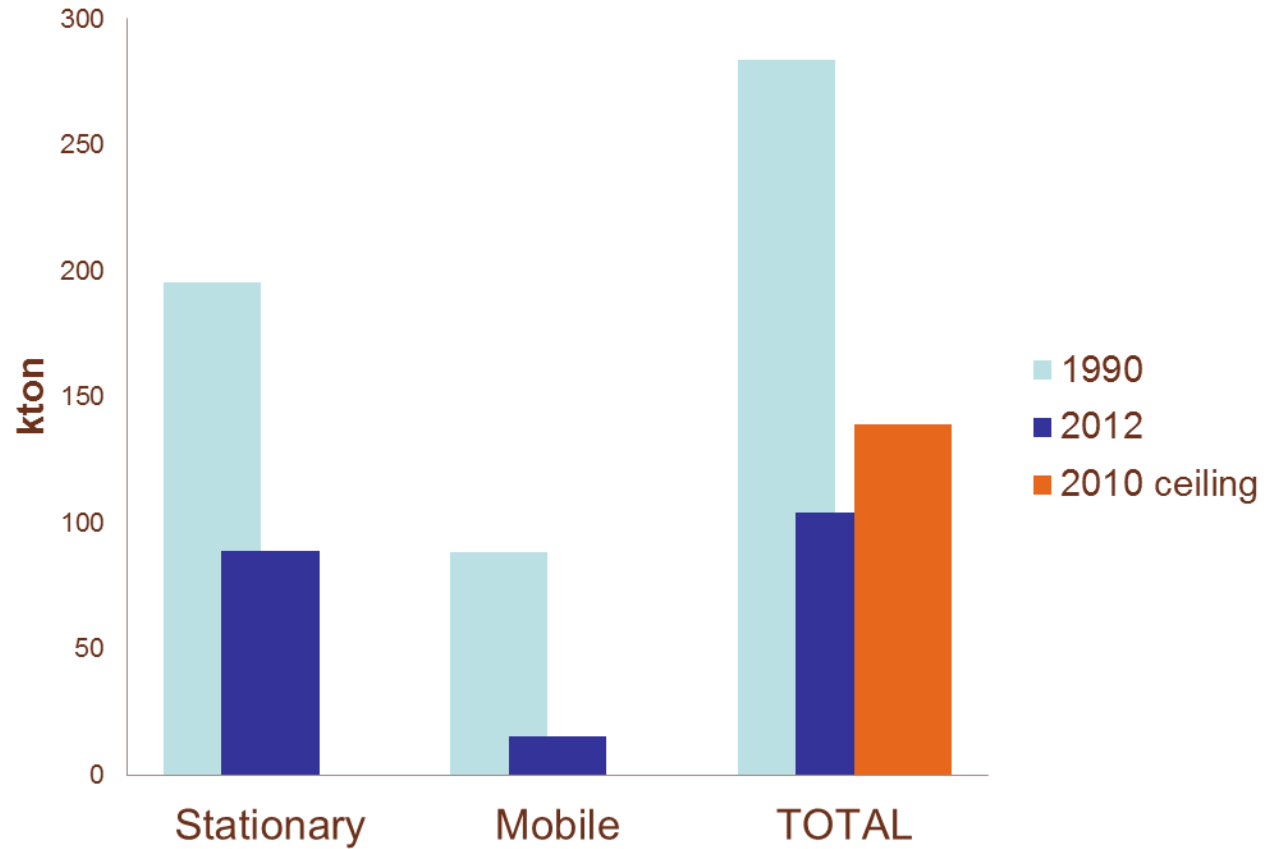


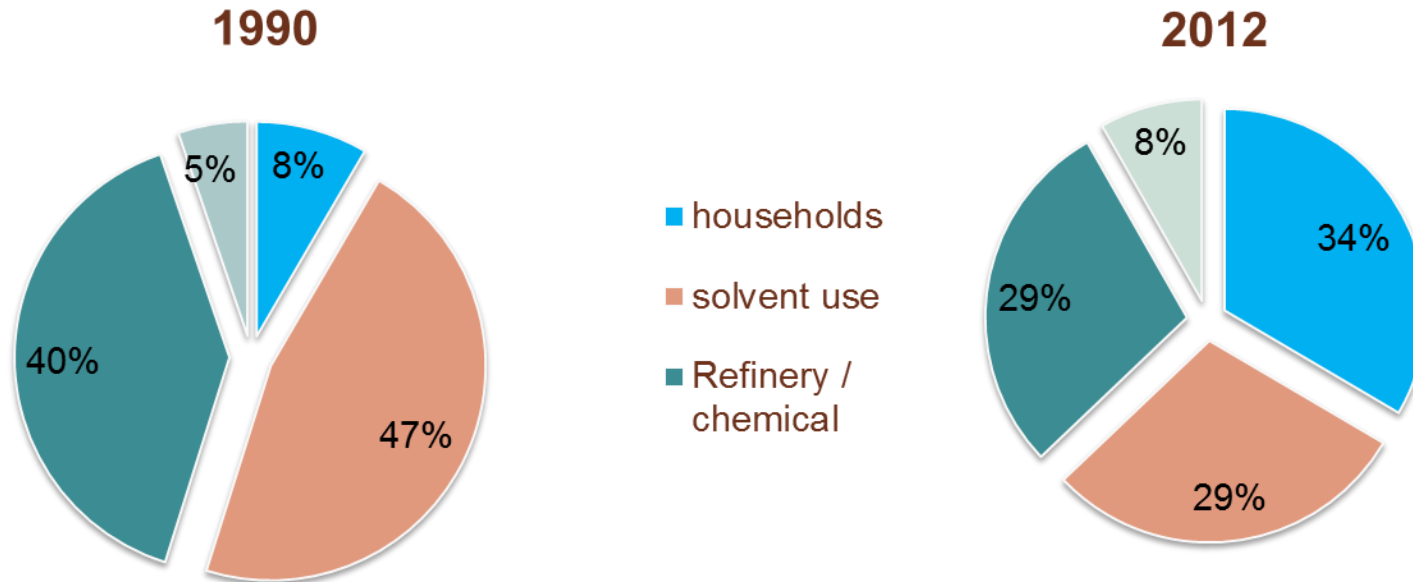
VOC emissions Chemical industry and Refineries Belgium

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VOC emission inventory

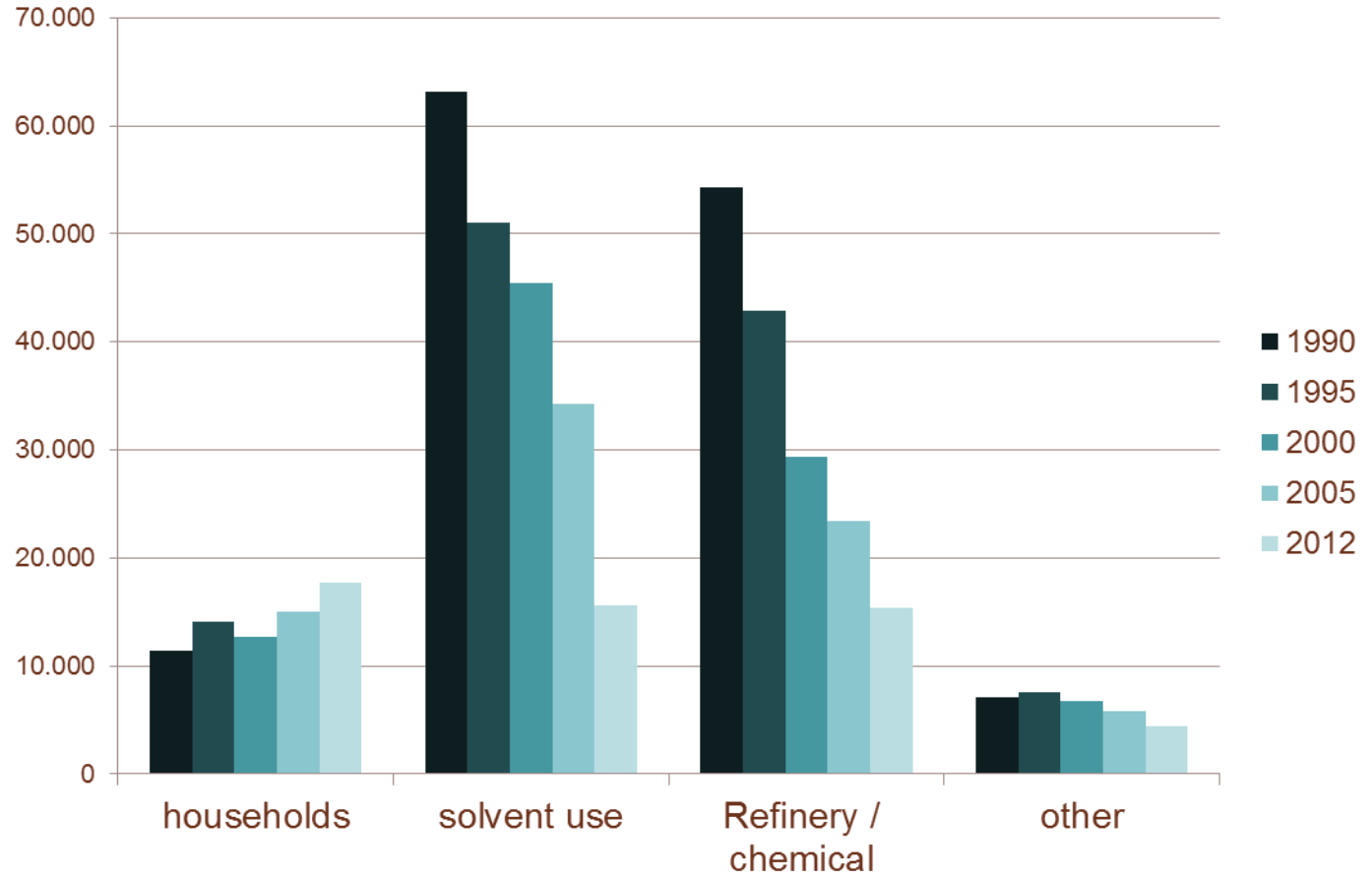


Stationary VOC sources 1990 vs 2012



- **Households: solvent use + heating (wood stoves!)**
- **Industrial solvent use: paint, oil extraction, ...**
- **Refinery / chemical: process installations + storage**

Evolution stationary sources: 1990 – 2012



Emission reduction measures: emissions from stacks

General emission limit values for stack emissions:

VOC	Mass treshhold	ELV
Class 1	100 g/h	20 mg/Nm ³
Class 2	2000 g/h	100 mg/Nm ³
Class 3	3000 g/h	150 mg/Nm ³

+ extra ELV for specific processes

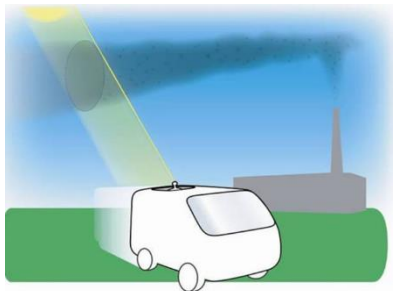
Emission reduction measures: diffuse emissions

Emission Source:	Measures taken:
Storage	Vapour return/destruction/recovery + Floating roof tanks
Loading of ships, trucks,...	Vapour return/destruction/recovery
Leaks in proces equipment	Leak Detection and Repair (LDAR)
Other	...



SOF measurements Antwerp Harbour

MEASUREMENTS OF VOC EMISSIONS AT PORT OF ANTWERP 2010



*Jerker Samuelsson and Johan Mellqvist, FluxSense AB
Antwerp, 13 December 2011*

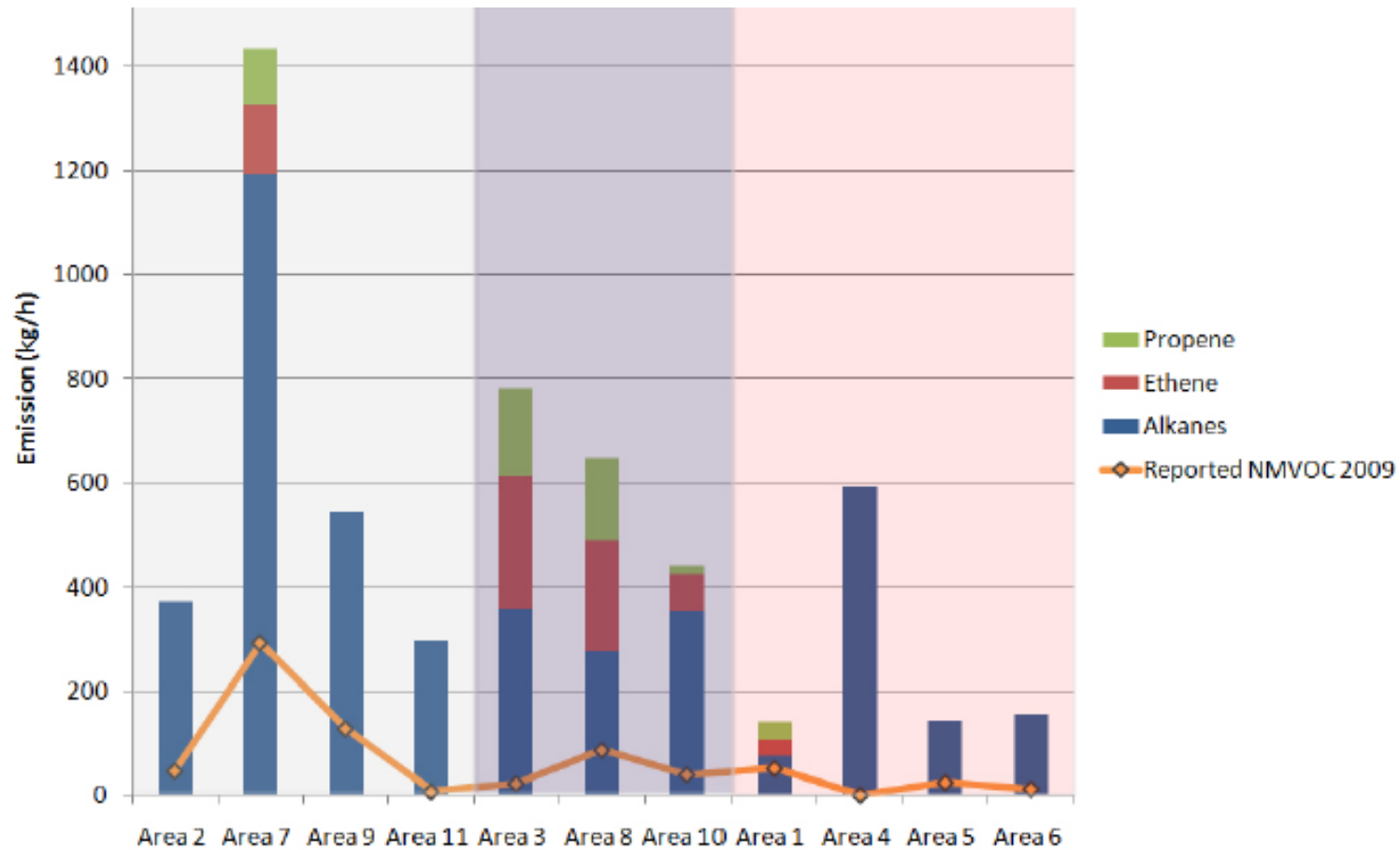


This work was initiated by the Environmental Inspectorate Division of the Flemish Environment, Nature and Energy Department (Flemish Authority)

SOF measurements Antwerp Harbour



SOF measurements Antwerp Harbour



Discrepancy: reported versus SOF

Possible reasons Different views!

1. SOF measurements are spot measurements: extrapolation needed.
2. Accuracy of SOF measurements

1. Accuracy of estimating methods: (1995 methodology)
2. Malfunctioning seals
3. Process equipment
4. Storage tanks (e.g. seals floating roof tanks)
5. Effectiveness of LDAR

Optical Gas imaging

Making VOC emissions visible

LEAKS IN PROCESS EQUIPMENT

20% of Leaks are not reachable with LDAR

LDAR: Labour intensive: targetted monitoring

LEAKS ON STORAGE TANKS

Many potential leaking points

Malfunctioing seals

Optical gas imaging techniques



VOC gas find camera



Web Maps **Afbeeldingen** Nieuws Video's Meer Zoekhulpmiddelen



Optical gas imaging techniques

Making VOC emissions visible



Normal “visible” sight



Camera “IR” sight

Optical gas imaging techniques



Optical gas imaging techniques



Solution: combination of techniques

BAT is to monitor diffuse VOC emissions to air from the entire site by using all of the following techniques :

1. LDAR
2. optical gas imaging techniques;
3. calculations of chronic emissions based on emissions factors periodically validated by measurements.

The screening and quantification of site emissions by periodic campaigns with optical absorption based techniques, such as differential absorption light detection and ranging (DIAL) or solar occultation flux (SOF) is a useful complementary technique.