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WORKSHOP ON IMPLEMENTATION OF VOLATILE ORGANIC COMPOUND (VOC) ABATEMENT TECHNIQUES IN THE SURFACE COATING, DRY CLEANING AND SURFACE DEGREASING SECTORS

Prepared by the secretariat with the collaboration of the host country

Introduction

1. In accordance with the work-plan for the implementation of the Convention (ECE/EB.AIR/71, annex IV, item 1.6) and at the invitation of the Government of Italy, a workshop on implementation of volatile organic compound (VOC) abatement techniques in the surface coating, dry cleaning and surface degreasing sectors took place in Bologna (Italy) from 19 to 21 February 2001.

2. More than 60 experts, representing governmental agencies, research institutes, industry and non-government organizations (NGOs), from 14 Parties to the Convention participated, including representatives of the Institute for Applied Systems Analysis (IIASA). The UN/ECE secretariat also attended.

3. Mrs. G. Gasparini from the Italian Ministry of the Environment welcomed participants on behalf of the host country. Mr. A. Jagusiewicz, UN/ECE secretariat to the Convention, outlined the basic obligations with respect to VOC abatement under the present and future legal frameworks.

4. The aim of the workshop was to review the approaches of Parties, particularly those with economies in transition, to controlling emissions of VOCs from stationary sources and from products, and to identify the best control options and techniques for surface coating and surface degreasing. The workshop also served to facilitate the exchange of information on technology among participants and to initiate direct industrial contacts between interested partners.

5. After the opening session, four working sessions of the workshop were devoted to dry cleaning, metal degreasing, wood coating and metal coating. The host country also organized visits to three plants in the area of Bologna with state-of-the-art VOC-abatement equipment for furniture-painting and wood-coating production lines and dry-cleaning and metal-degreasing machines.

6. More than 30 presentations were given at the workshop, including statements on policies to abate VOC emissions from stationary sources and manage VOC-containing products, from the following countries with economies in transition: Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Russian Federation and Slovakia.

7. The workshop participants expressed their appreciation to the host country for providing excellent workshop facilities, organizing technical visits, sponsoring the participants from countries with economies in transition and for its warm hospitality.

I. CONCLUSIONS

8. Based on the summaries by the four sessions' chairpersons, the participants drew the following conclusions:

(a) The dry-cleaning machines currently dominating the market are so-called fourth-generation (completely closed circuit "dry to dry" with refrigerator-type condensors and regenerative active carbon filters) and fifth-generation (completely closed circuit with continuous monitoring of the solvent concentrations used) machines using chlorinated solvents. They can easily meet the requirements of the European Union (EU) Solvent Directive and the limit values recommended in the 1999 Gothenburg Protocol, annex VI, with respect to dry-cleaning operations;

(b) Machines using water-based detergents are also commercially available and are increasing their market share. Although they emit fewer VOCs and are better for occupational health, they need waste-water treatment plants and use more energy. Their use in cleaning operations is therefore site-dependent;

(c) Emerging techniques for cleaning garments and metal degreasing are liquid-CO_2 machines. However, their use is limited due to the high pressures inside the machines and the related safety requirements as well as to the difficulties in maintaining the necessary fluid dynamic conditions;

(d) Metal degreasing, more than dry-cleaning, makes wide use of water-based systems, both in open installations and in closed machines. The share is sector-dependent; in the automotive sector almost 90% of degreasing applications are water-based;

(e) Engineered fluids, so-called HFEs (hydrofluoroethers), are marketed for use in vapour-degreasing applications. They have been designed to replace ozone-depleting substances and have high boiling points, increased solvency and low surface tension;

(f) Demonstration projects with cleaning and/or degreasing operations using water-based detergents, liquid-CO_2 and engineered fluids are considered as the most effective ways for substituting chlorinated solvents;

(g) To meet the limit values for dry-cleaning or metal-degreasing activities, a mix of different techniques may be required using condensation, adsorption, absorption and closed-circuit operations as well as the use of various cleaning media. The choice will depend *inter alia* on the exhaust gas parameters and will therefore always need to be adapted to case-specific conditions;

(h) Solvent management plans are considered the best way to contain all types of VOC emissions, to verify the measures taken with respect to the processes and products used, and to make progress in future reduction options/techniques;

(i) Sector/branch-specific solutions (developed in collaboration with producers of paints and application techniques, their users and the environment protection authorities) are particularly suitable for small furniture manufacturers, and lead to the best results;

(j) Water-based, photopolymerizing (solvent- and water-based ultraviolet-cured), and powder coatings are at present the best alternatives to solvent-based coatings. Their share of the market is continuing to grow. They generally lead to large reductions in solvent emissions, up to 90%, and to decreases in coating wastes, while maintaining the high quality of the coating;

(k) If emissions characterized by a large air quantity and a low solvent concentration are to be treated, a pre-concentration unit upstream of the combustion chamber is the most suitable plant solution;

(l) The untraviolet-cured products work best if applied to plane surfaces. Applications to more complex surfaces or shapes do not yet comply with market quality requirements. Research and development of products and processing is still required to enable broader applications;

(m) Water-based paints are widely used for external applications (e.g. windows), but they are not yet widely accepted in the furniture industry (especially in southern Europe). This is being addressed by promoting the latest generation of water-based paints, though these involve a complete change of the painting cycle;

(n) Price differences between classic and alternative paints are acceptable when considering not only the product costs but also the great economic benefits;

(o) Powder paints are starting to be applied to cheap wood panels (not on wood) in pilot plant. However, more research and development work is necessary to improve the quality of these applications;

(p) In the metal-coating process, the use of alternative paints is more advanced than in wood coating, due to the different properties of the substrates. Powder paints have an important share of the market (in Italy more than 100,000 tons per year are produced), and water-based paints are more widespread than in the wood sector;

(q) The need for eco-efficiency is recognized, e.g. environmental solutions are only feasible if they lead to the manufacturing of high-quality, marketable products.

II. DRAFT RECOMMENDATIONS

9. The workshop made the following draft recommendations:

(a) Care should be taken to ensure that replacement and/or substitution of control techniques and products, e.g. water-based detergents and HFEs, do not create other environmental problems. In general, integrated approaches across all environmental media, fully taking into account the environmental impact of substitutes, are strongly recommended;

(b) In order to effectively control small VOC emissions from dry-cleaning operations, i.e. less than 1-2 tons/year (the threshold limit required by the EU Solvent Directive), such operations should be subject to licensing procedures;

(c) Tailor-made plant-specific solutions, using a combination of measures, e.g. replacement of solvent-containing preparations, and with proper application techniques and abatement measures, should be implemented;

(d) Sector/branch-specific solutions should be sought for small-scale enterprises in collaboration with all stakeholders;

(e) Only eco-efficient site-specific solutions that allow for the cost-effective production of high-quality goods in an environmentally sound manner should be implemented. An in-depth integrated analysis of production line, painting and cleaning products and their environmental impact should be made to find the best case-specific solution;

(f) Present state-of-the-art technology does not completely eliminate solvents from cleaning or painting products. The overall aim should be to reduce VOC emissions by every available method.