

## **European Council of Vinyl Manufacturers (ECVM)**

### **Industry Charter for Production of VCM and PVC (Suspension Process)**

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is an autonomous,  
independent Foundation  
with the objective of  
safeguarding life, property  
and the environment*



## ***Verification Statement***

### **Background**

DNV has been engaged by ECVM for a second time to report on compliance with the Industry Charter for the production of vinyl chloride monomer (VCM) and polyvinyl chloride (PVC). The Charter, which was signed in 1995, committed member companies to comply with environmental standards by the end of 1998.

The Charter is a voluntary code of practice that is designed to commit signatories to adopt best available technology (BAT) to minimise emissions to the environment. The standards defined in the Annex were subsequently taken into account in the Oslo and Paris Commission BAT document. These requirements will take effect from 2003 and 2006 for PVC and VCM plants respectively.

DNV has undertaken a formal independent review of compliance at each participating site of the ECVM member companies.

ECVM has also published a second Charter that establishes standards for PVC manufactured by the emulsion process. This will be subject to a separate verification programme in 2004.

### **Scope and Basis of Verification**

The verification scope covered the 12 environmental standards detailed in the Annex to the Industry Charter. This applies to VCM, ethylene dichloride (EDC, an intermediate product) and suspension PVC (S-PVC).

The ECVM BAT document (Appendix 5) provides supporting requirements for the Charter standards, which have been used as criteria for the verification process. These requirements were developed by ECVM in response to a recommendation in the previous verification, which found significant variation in interpretation of the Charter requirements across Europe, due to limited underlying definitions and specifications.

The ECVM membership consists of 10 companies, comprising 38 sites listed below. There have been 5 site closures and 1 site has changed to an alternative production process since the 1998 verification. The EVC Runcorn VCM plant (which did not take part in the first exercise), has participated for the first time. Novacké, the Slovak PVC producer which joined ECVM on the 1<sup>st</sup> January 2003, is not part of the verification.

The new Vintron (Vinnolit) EDC/VCM process at Hurth was only commissioned in 2002, so is excluded from the verification. All other plants have participated in the current verification exercise.

ECVM represents around 98% of the total European Union manufacturing capacity for S-PVC.

Key verification boundaries:

- **1<sup>st</sup> January to 30<sup>th</sup> June 2002** was the primary verification period. However some standards are annual averages or require only one measurement per year, so measurements 6 months either side of the verification period were also accepted. Demonstration of improvements since the end of June 2002 was also acknowledged. Departures from the primary verification period are noted in Appendix 1.
- The Charter currently applies to ECVM member owned and operated assets only. In most cases the verification excluded third party waste treatment facilities (see Appendix 1 for details).
- The Charter applies to normal production periods. This excludes emergency/accidental releases and also non-normal operations as defined by ECVM (e.g. maintenance shutdowns). The verifiers have considered that emission excursions from non-normal operations should not occur for more than 3% of the time. This is considered to represent a reasonable upper limit for maintenance activities of emission abatement equipment while production is otherwise continuing normally. Extended periods of non-normal operations are noted in Appendix 1.

## Process

The verification involved visits to all plants to verify company-generated and/or external monitoring data, and supporting systems and procedures used to collect and report this data.

As with the previous verification, the input from ECVM member companies was characterised by openness, co-operation and keenness to demonstrate improvements.

The scale and nature of this initiative continues to make it unique. The learning has been evident, with improvements to compliance and the provision of information to demonstrate this.

## Results

DNV has established a transparent assessment and reporting process. Whilst some of the standards can still be left open to interpretation, we have tried to apply the spirit and intent of the Charter when coming to our conclusions. However, in particular, the VCM to water standard is applied with varying stringency, because the BAT document is not specific enough about the requirements.

The results must therefore be interpreted within the context of the notes for each site in the summary of compliance (Appendix 1).

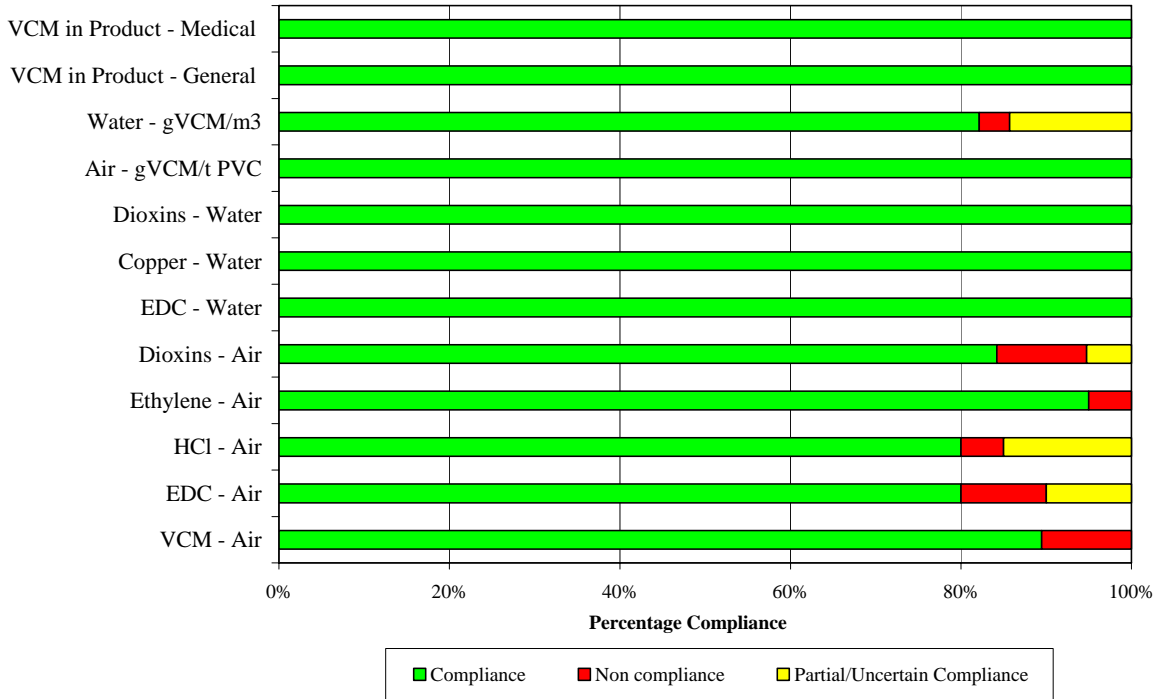
The 12 standards relate to different types of production in the S-PVC manufacturing cycle. For the 38 participating sites, this results in a total of 264 applications. The compliance results are summarised as follows:

- 93% compliance has been achieved across all applications of the standards. This is an improvement from the 88% compliance achieved in 1998.
- 4% were either partially compliant, or there were uncertainties around the reported data which could not allow compliance to be confirmed.
- 3% non-compliance was observed across all applications of the standards (compared to 9% in 1998).

The non-compliance by EVC is to a large extent a consequence of a fire at the incinerator on their Runcorn VCM plant in April 2002. If the wider ECVM results are compared with 1998, like for like (i.e. excluding Runcorn), then the instances of non-compliance in 2002 are only 2%.

Figure 1 below summarises performance in terms of percentage compliance for each standard.

**Figure 1: Overall Percentage Compliance of Participating ECVM Member Sites Against Each Charter Standard**



Improvements since the previous verification are shown in Figure 2. Two standards show a slight decline (EDC to air and HCl to air).

**Figure 2: Comparison of Compliance with 1998**

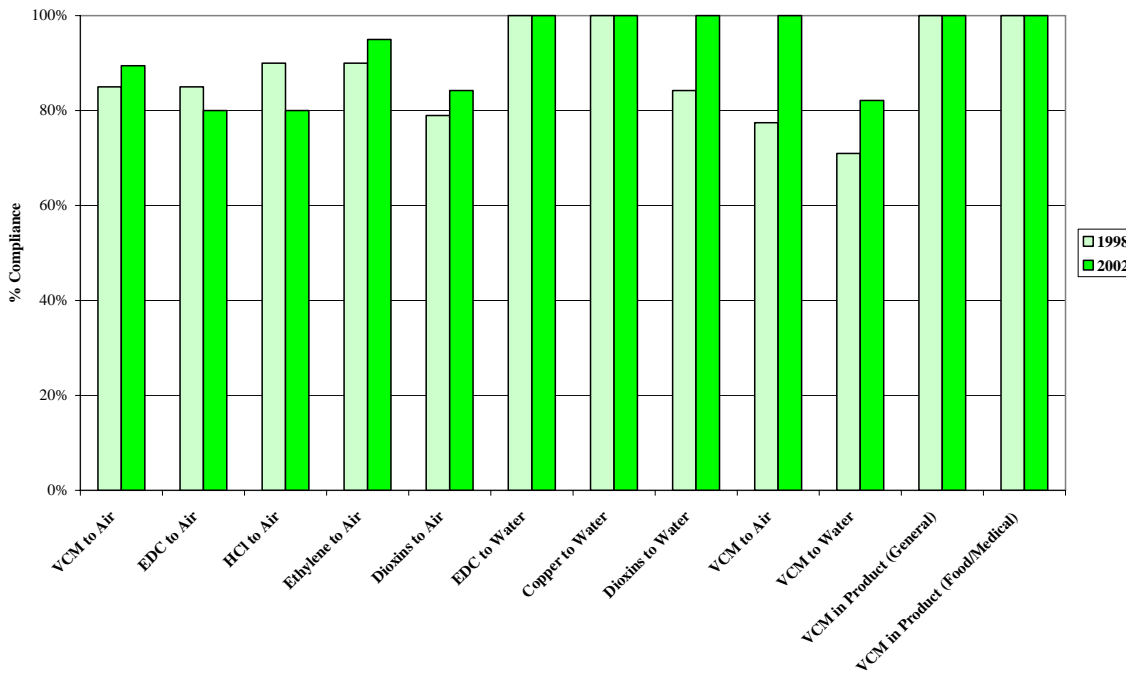
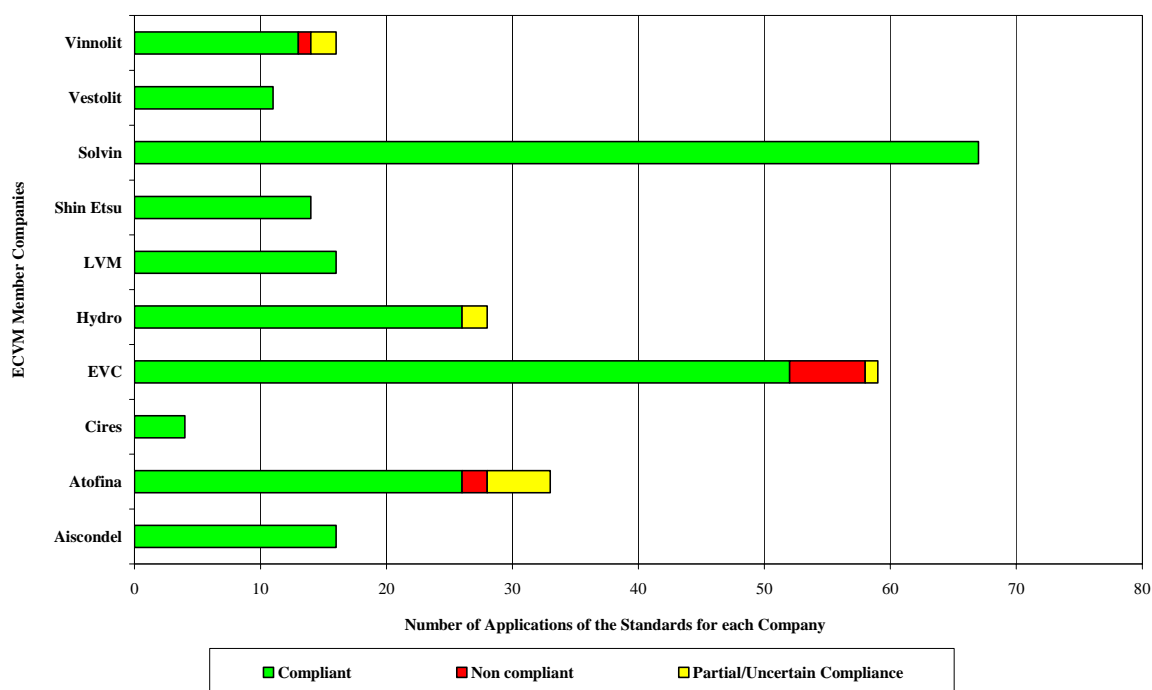


Figure 3 presents compliance for each participating ECVM Member Company.

**Figure 3: Compliance by Participating ECVM Member Companies**



## Conclusions and Recommendations

Four years on from the original target date, full compliance across the membership has yet to be achieved. However, improvements have been made, both in terms of the proportion of sites included within the verification and in actual performance against the Charter requirements. Additional information from sites since the end of June 2002 indicates that the goal of full compliance is even closer.

A number of issues have arisen as a result of the verification exercise, which impact the consistency of compliance reporting and the underlying appropriateness of certain of the Charter standards. DNV has identified a number of recommendations which would increase transparency. These recommendations should be implemented by the next verification cycle wherever practical:

- The requirements defined in the BAT document need to be reviewed, to ensure fair comparison across sites and to ensure that standards are meaningful with respect to environmental impact and abatement techniques. For example, the current VCM to water standard makes it difficult to allow performance to be assessed consistently across sites. The standard needs to be revised to accommodate differences in plant design and prevent dilution practises. Defining a production related target could, for example, be a way to avoid inconsistencies.
- Comparability is also distorted where some sites send wastes/effluents for third party treatment, which is not covered by the Charter. These facilities should fall within the full verification envelope, by the next cycle, wherever practical.
- The exclusion of accidents/emergencies and non-normal operations is not transparent. A mechanism for reporting these types of incidents/events should be introduced.

- The HCl criterion is less stringent than the European hazardous waste incineration directive (94/67/EC). The EU Directive has a limit of 10mg/m<sup>3</sup> and the ECVM Charter is 30mg/m<sup>3</sup>. It is recommended that the Charter is revised to reflect the EU Directive.

On a broader theme, currently the only means of reporting performance against the Charter has been through two third party verification exercises. It is recommended that systematic annual reporting against the Charter is introduced and communicated publicly. This would allow progress and improvements to be tracked on a more on-going basis with or without third party verification.



**E.D. Pape**  
Director



**Paula Murphy**  
Project Manager



**Amy Annand**  
Lead Verifier, UK



**Gabriele Franke**  
Lead Verifier, Germany



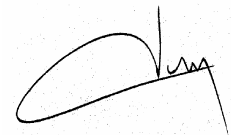
**Tommy Johnsen**  
Lead Verifier, Norway



**Luc Larmuseau**  
Lead Verifier, Netherlands



**Fabio Lo Brutto**  
Lead Verifier, Italy



**Philippe Decq**  
Lead Verifier, France

### ECVM Member Manufacturing Sites

	Company	Location	EDC/VCM Production	S-PVC Production		Company	Location	EDC/VCM Production	S-PVC Production
	<b>BELGIUM</b>					<b>ITALY</b>			
1	LVM	Tessenderlo	✓ <sup>1</sup>		22	EVC	P. Marghera	✓ <sup>1</sup>	✓
2	Solvin <sup>6</sup>	Antwerp	✓ <sup>2,3</sup>		23	EVC	P. Torres	✓ <sup>4,5</sup>	
3	Solvin	Jemeppe	✓	✓	24	EVC	Ravenna	✓ <sup>1</sup>	✓
	<b>FINLAND</b>					<b>NETHERLANDS</b>			
4	Dynea <sup>7</sup>	Porvoo		✓	25	LVM	Beek		✓
	<b>FRANCE</b>				26	Shin Etsu	Botlek	✓ <sup>1</sup>	
5	Atofina	Balan		✓	27	Shin Etsu	Pernis		✓
6	Atofina	Jarrie	✓ <sup>2</sup>			<b>NORWAY</b>			
7	Atofina	Lavera	✓		28	Hydro Polymers	Porsgrunn		✓
8	Atofina	St Auban		✓	29	Hydro Polymers	Rafnes	✓	
9	Atofina/Vinyl Fos	Fos/ mer	✓			<b>PORTUGAL</b>			
10	LVM	Mazingarbe		✓	30	Cires	Estarreja		✓
11	Elf Atochem/ Vinyl Berre	Berre		✓		<b>SPAIN</b>			
12	Solvin	Tavaux	✓	✓	31	Solvin	Martorell		✓
	<b>GERMANY</b>				32	Solvin	Martorell	✓	
13	Solvin <sup>6</sup>	Ludwigshafen	✓ <sup>1</sup>	✓	33	Aiscondel <sup>1</sup>	Tarragona	✓	✓
14	EVC	Wilhelmshaven	✓ <sup>1</sup>	✓	34	Aiscondel <sup>1</sup>	Monzon		✓
15	EVC	Schkopau		✓		<b>SWEDEN</b>			
16	Solvin	Rheinberg	✓ <sup>1</sup>	✓	35	Hydro Polymers	Stenungsund	✓	✓
17	Vinnolit	Marl	✓	✓		<b>UK</b>			
18	Vinnolit	Burghausen		✓	36	EVC	Barry		✓
19	Vinnolit	Gendorf <sup>1</sup>	✓		37	EVC	Runcorn	✓ <sup>5</sup>	✓
20	Vinnolit	Hurth	✓ <sup>4</sup>	✓	38	Hydro Polymers	Aycliffe		✓
21	Vinnolit	Koln		✓					

<sup>1</sup> Third party waste treatment facilities (incinerators and/or waste water treatment) are excluded from the Charter and the verification exercise.

<sup>2</sup> EDC production unit only.

<sup>3</sup> Verification excludes emissions from off-site EDC storage tanks.

<sup>4</sup> Site excluded from the verification programme due to commissioning in 2002.

<sup>5</sup> Verification excludes emissions from manufacture of imported EDC from third party.

<sup>6</sup> Previously BASF owned plant

<sup>7</sup> Owned and operated by Dynea on behalf of Shin-Etsu


**APPENDIX 1**  
**INDIVIDUAL SITE COMPLIANCE**

### INDIVIDUAL SITE COMPLIANCE

 = Standard not applicable

Company	Plant	Production	EDC/VCM Production							PVC Production				
			Releases to Air (per Nm <sup>3</sup> )					Releases to Water (per tonne EDC purification or oxychlorination capacity)		Releases of VCM				
			VCM <5mg	EDC <5mg	HCl <30mg	Ethylene <150mg	Dioxins <0.1ng TEQ	EDC <5g	Copper <1g	Dioxins <1µg TEQ	Air <100g/t PVC	Water <1g/m <sup>3</sup>	Product General <5g/t PVC	Product Medical <1g/t PVC
Aiscondel	Monzon	PVC									Yes	Yes	Yes	Yes
Aiscondel	Vila-Seca <sup>1,2</sup>	EDC/VCM/PVC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes <sup>3</sup>	Yes	Yes	Yes	Yes
Atofina	Jarrie	EDC	No	No	Yes	Yes		Yes						
Atofina	St Auban	PVC									Yes	Yes	Yes	Yes
Atofina	Balan	PVC									Yes	? <sup>4</sup>	Yes	Yes
Atofina	Lavera <sup>1</sup>	EDC/VCM	Yes	Partial <sup>5</sup>	Yes	Yes	Yes	Yes	Yes	Yes				
Atofina	Fos sur Mer <sup>6</sup>	EDC/VCM	Yes	Partial <sup>5</sup>	? <sup>7</sup>	Yes	Yes	Yes	Yes	Yes				
Cires	Estarreja	PVC									Yes	Yes	Yes	Yes
Dynea	Porvoo	PVC									Yes	Yes	Yes	Yes
EVC	Wilhelmshaven	PVC, EDC/VCM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EVC	Barry	PVC									Yes	Yes <sup>8</sup>	Yes	Yes
EVC	Runcorn <sup>9</sup>	PVC, EDC/VCM	No <sup>10</sup>	No <sup>10</sup>	No <sup>11</sup>	No <sup>10</sup>	No <sup>12</sup>	Yes	Yes	Yes	Yes	Yes <sup>13</sup>	Yes	Yes
EVC	Schkopau	PVC									Yes	? <sup>14</sup>	Yes	Yes
EVC	Porto Marghera <sup>1</sup>	PVC, EDC/VCM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EVC	Porto Torres <sup>15</sup>	EDC/VCM	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes				
EVC	Ravenna <sup>16</sup>	PVC, EDC/VCM						Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hydro	Newton Aycliffe	PVC									Yes	? <sup>17</sup>	Yes	Yes
Hydro	Porsgrun	PVC									Yes	Yes <sup>18</sup>	Yes	Yes



 = Standard not applicable

Company	Plant	Production	EDC/VCM Production								PVC Production			
			Releases to Air (per Nm <sup>3</sup> )					Releases to Water (per tonne EDC purification or oxychlorination capacity)			Releases of VCM			
			VCM <5mg	EDC <5mg	HCl <30mg	Ethylene <150mg	Dioxins <0.1ng TEQ	EDC <5g	Copper <1g	Dioxins <1µg TEQ	Air <100g/t PVC	Water <1g/m <sup>3</sup>	Product General <5g/t PVC	Product Medical <1g/t PVC
Hydro	Rafnes	EDC/VCM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes				
Hydro	Stenungsund	PVC, EDC/VCM	Yes	Yes	? <sup>19</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LVM	Tessenderlo <sup>1, 20</sup>	EDC/VCM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes				
LVM	Beek	PVC									Yes	Yes	Yes	Yes
LVM	Mazingarbe	PVC									Yes	Yes	Yes	Yes
Shin Etsu	Botlek <sup>21</sup>	EDC/VCM	Yes	Yes	Yes	Yes	Yes	Yes						
Shin Etsu	Pernis	PVC									Yes	Yes	Yes	Yes
VinylBerre	Berre	PVC									Yes	? <sup>22</sup>	Yes	Yes
Solvint	Martorell	PVC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Solvint	Zandvliet, Antwerp	EDC		Yes <sup>23</sup>	Yes <sup>24</sup>	Yes	Yes	Yes	Yes	Yes				
Solvint	Jemeppe	PVC, EDC/VCM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes <sup>25</sup>	Yes	Yes
Solvint	Rheinberg <sup>26</sup>	PVC, EDC/VCM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes <sup>27</sup>	Yes	Yes	Yes	Yes
Solvint	Tavaux	PVC, EDC/VCM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Solvint	Ludwigshafen	PVC, EDC/VCM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vestolit	Marl	PVC, EDC/VCM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vinnolit	Hurth <sup>28</sup>	PVC, EDC/VCM									Yes	No <sup>29</sup>	Yes	
Vinnolit	Koln	PVC									Yes	Yes	Yes	Yes
Vinnolit	Burghausen	PVC									Yes	Yes	Yes	Yes
Vinnolit	Gendorf <sup>30</sup>	EDC/VCM	Yes	Yes	? <sup>31</sup>	Yes	Partial <sup>32</sup>							

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- <sup>1</sup> Verification excludes emissions from third party incineration of liquid chlorinated hydrocarbons
  - <sup>2</sup> This plant experienced non-normal operations (incinerator shutdown and use of flare instead) for 7% of the verification period (excluded from verification).
  - <sup>3</sup> Compliance is based on last measurement in November 2001, outside the primary verification period.
  - <sup>4</sup> Sampling location/frequency does not meet the BAT specification during the verification period so compliance cannot be confirmed.
  - <sup>5</sup> EDC storage tank vents exceeded the Charter during the verification period. These vents were connected to the incinerator during summer 2002, so the site should now be compliant.
  - <sup>6</sup> This plant experienced non-normal operations (incinerator shutdown) for 7% of the verification period (excluded from verification).
  - <sup>7</sup> Sampling location/frequency did not meet the BAT specification during the verification period so compliance cannot be confirmed. Continuous monitoring should be operational in 2003.
  - <sup>8</sup> Compliance based on average of samples for Jan-Dec 2002, rather than the primary verification period.
  - <sup>9</sup> Verification excludes emissions from manufacture of EDC imported from Ineos Chlor.
  - <sup>10</sup> Non-compliance is mainly associated with significant incinerator downtime (mainly due to a fire in April 2002).
  - <sup>11</sup> Continuous monitoring does not cover the full verification period. A number of spot (hourly average) releases also exceed twice the limit.
  - <sup>12</sup> Dioxins increase is mainly as a result of the incinerator fire in April 2002.
  - <sup>13</sup> Compliance is based on average of available measurements (April to November 2002, rather than the primary verification period).
  - <sup>14</sup> Sampling location/frequency does not meet the BAT specification during the verification period so compliance cannot be confirmed. However, a number of samples at the correct location in January 2003 indicate compliance with this standard.
  - <sup>15</sup> Verification excludes emissions from manufacture of EDC imported from Enichem and third party incineration of liquid chlorinated hydrocarbons.
  - <sup>16</sup> Verification excludes all emissions to atmosphere due to restricted access to third party treatment facility.
  - <sup>17</sup> Compliance is uncertain for one of the effluent outlets from the plant and sampling location/frequencies do not meet the BAT specification. The average across outlets is within the limit.
  - <sup>18</sup> Compliance excludes 3 high results, which were due to problems with the waste water stripper and are classified as non-normal operations.
  - <sup>19</sup> Monitoring requirements did not meet the BAT specification during the verification period therefore compliance cannot be confirmed. However, continuous monitoring was installed in June and the data for July-Dec 2002 indicates compliance.
  - <sup>20</sup> This plant experienced non-normal operations (incinerator shutdown) for 5% of the verification period (excluded from verification).
  - <sup>21</sup> Verification excludes emissions from 2 third party incinerators for disposal of oxychlorination vent gases and liquid chlorinated by-products. Verification also excludes dioxins and copper emissions from third party water treatment facilities.
  - <sup>22</sup> Sampling location/frequency does not meet the BAT specification during the verification period so compliance cannot be confirmed. Samples at a more appropriate location in January 2003 indicate compliance with this standard.
  - <sup>23</sup> Verification excludes emissions from off-site EDC storage tanks.
  - <sup>24</sup> Compliance is based on available monthly samples (July-November 2002, rather than the primary verification period).
  - <sup>25</sup> Compliance is based on average of samples for January-November 2002, rather than the primary verification period.
  - <sup>26</sup> Verification excludes emissions from third party incineration of liquid chlorinated hydrocarbons (except for dioxins, which have been verified).
  - <sup>27</sup> Compliance based on last dioxin analysis in November 2001 and July 2002 outside the primary verification period.
  - <sup>28</sup> Verification excludes a new EDC/VCM plant which was commissioned in 2002 and was therefore not in steady state operation for a significant part of verification period.
  - <sup>29</sup> Emissions have improved since August 2002. Average concentration from August to December 2002 is in compliance.
  - <sup>30</sup> Verification excludes third party waste water treatment plant.
  - <sup>31</sup> Sampling frequency does not meet the BAT specification for combined liquid/vent incinerators, so compliance cannot be confirmed. However, samples taken for regulatory purposes were within the Charter limits.
  - <sup>32</sup> Incinerator is compliant. However, the catalytic oxidation unit (which was in operation for 81% of the verification period) is not.