Risk Reduction Strategy on the Use of Short-Chain Chlorinated Paraffins in Leather Processing

Final Report - December 1997

prepared for

Chemicals and Biotechnology Division
of the
Department of the Environment, Transport and the Regions

by

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RPA REPORT - ASSURED QUALITY	
Project: Ref/Title	J222/RBA SCCPs - Leather
Approach:	As set out in proposal and taking account of comments from client and industry
Report Status:	Final
Prepared by:	L Reynolds, Consultant
Report approved for issue by:	L Moore, Senior Consultant
Date:	17 December 1997

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SUMMARY

A risk assessment has found that the formulation and use of SCCPs as leather processing products poses a risk to the aquatic environment. As rapporteur for SCCPs, the UK Department of the Environment, Transport and the Regions commissioned this study to identify and evaluate appropriate risk reduction options.

SCCPs are used as inexpensive additives to fatliquors to provide greater product volume (i.e. they are bulking agents). Fatliquors replace oils that are lost during the tanning process, however it appears that no fatliquoring properties are conferred by the use of SCCPs. The only benefits that they offer over alternatives appear to be their odour-free nature and their reasonable price. However, no tanner has indicated that the use of alternatives (any of a range of animal, vegetable or mineral oils) would alter the quality of end-products. Although alternatives are around 15% more expensive than SCCPs, this is equivalent to only 0.075% of turnover arising from SCCP-treated hide for a small tanner (i.e. a tanner with <50 employees). The environmental risks posed by alternatives appear to be less than those posed by SCCPs.

Three risk reduction options were considered to be appropriate for analysis at this stage:

- classification and labelling;
- marketing and use restrictions; and
- limits on emissions.

Having undertaken a semi-qualitative, semi-quantitative analysis, it is concluded that both marketing and use restrictions and limits on emissions would reduce the risks from SCCPs used for leather processing. However, monitoring for limits on emissions appears to be costly, while costs associated with marketing and use restrictions appear to be low. Marketing and use restrictions would also immediately and totally eliminate the risks associated with the release of SCCPs from use with leather. In contrast, limit values on emissions would suffer from administrative delays and, once introduced, may not control 100% of emissions.

Marketing and use restrictions are, therefore, recommended as the most effective, least cost option for reducing the risks associated with the formulation and use of SCCP-containing leather processing products.

1. BACKGROUND

Use Pattern of Substance

Short chain length chlorinated paraffins (SCCPs) are hydrocarbons of chain length C_{10} to C_{13} inclusive, chlorinated in excess of 48%. SCCPs in general have a variety of uses, including extreme pressure additives in metalworking fluids, flame retardants in rubbers and textiles, in leather processing and as a plasticiser in paints and sealing compounds (BRE, 1995[1]).

[1] BRE (1995): *Draft Risk Assessment on SCCPs*, prepared for the UK DETR, August.

In European leather processing[2], SCCPs are used in small amounts in lower grade fatliquoring agents, during wet dyeing. When used as fatliquors, they may be stored neat (as 100% SCCPs) and offered to the leather with other components to form a 'brew', or may form part of a fatliquoring agent. SCCPs may comprise around 20% of the fatliquoring mix.

When offered to the leather[3], between 95% and 99% of the SCCPs may be taken-up, leaving between 1% and 5% of the SCCPs in the waste 'washings'. Some facilities apparently treat the washings (with, for example, forric acid) to destabilise them before disposal. Disposal is apparently to drain.

Reasons for Concern over SCCPs

Concerns over the use of SCCPs were highlighted in 1995 by the Paris Commission's (PARCOM) Decision 95/1 which stated that:

- SCCPs have been found in the aquatic environment and in aquatic and terrestrial organisms;
- SCCPs are persistent;
- SCCPs are toxic to aquatic organisms and bioaccumulate in certain species; and
- less environmentally hazardous substitutes are available for most major applications of SCCPs.

The Decision required that the use of SCCPs be phased out by the year 2000 for some applications and by 2005 for others. As a result of the PARCOM Decision, the two European producers of SCCPs, representing 95% of current European consumption, are attempting to encourage users (including formulators of leather processing products) to move away from SCCPs.

Signatories to PARCOM include Member States and the EU as a whole and so in order to implement Decision 95/1, Member States required guiding legislation from the EC. SCCPs are also listed as a priority substance under the Existing Substances Regulation (793/93/EEC) which requires that a risk assessment is undertaken and appropriate risk reduction options are recommended by the relevant rapporteur. In the case of SCCPs, the UK Government is responsible for evaluating the risks associated with the use of SCCPs. The associated risk assessment is in the process of being accepted by Member States and this has considered the use of SCCPs for leather finishing; in textile applications; for sealants, rubber and paints; and in metalworking fluids.

The risk assessment found that risks in metalworking fluids and leather finishing products are too high. Thus, risk reduction measures are required to be evaluated and the most appropriate recommended to the EU by the rapporteur.

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2 This is not to be confused with 'leather finishing' which may appear to be a general term but is technically specific. This study has found no evidence to suggest that SCCPs are used for 'leather finishing'.

3 For the purposes of this report, the term 'leather' is taken to include hide and skin as well as splits.

2. THE RISK ASSESSMENT

The Draft Risk Assessment, undertaken by the Building and Research Establishment (BRE), has concluded the following about the use of SCCPs in leather processing.

i) significant hazardous effects

A detailed discussion of the hazard posed by SCCPs and the associated dose-response assessment for the aquatic (water and sediment), terrestrial, atmospheric, and secondary poisoning compartments is provided in Section 3.2 of the *Draft Risk Assessment* (June 1997).

The most sensitive species to SCCP exposure was found to be *Daphnia magna* with a no observed effect concentration (NOEC) as low as 0.005 mg/l. SCCPs also have a very high potential for bioaccumulation, with a reported log K_{ow} ranging from 4.39 to 8.69. To put this in context, the pesticide DDT has a log K_{ow} of 6.2 (Cronor's, 1997[4]) which is below the mid range reported for SCCPs[5]. In other words, SCCPs have a similar bioaccumulation potential to DDT (bioaccumulation being a major factor in the banning of DDT as a pesticide).

ii) routes of exposure

Disposal of waste washings from the use of SCCPs for leather processing can result in the release of SCCPs to the aquatic environment as disposal is apparently to drain.

The production of SCCPs and the formulation of products containing SCCPs for use in leather processing may also result in SCCPs being released to the environment.

iii) population and/or ecosystems exposed to risks which need to be limited

The use of SCCP-containing leather processing products poses risks to aquatic organisms in surface water from local exposure.

The production of SCCPs, the formulation of SCCP-containing leather processing products and their use poses possible risks to soil dwelling organisms in agricultural soils at both a local and regional level due to the spreading of sewage sludge. At a regional level, these exposure pathways may pose risks to sediment dwelling organisms.

iv) imminence and degree of any risks which need to be limited

The risk assessment concludes that:

- release of SCCPs to waste water from production are likely to be less than 9.9-26.7 kg/year for Europe, based on data provided by the two European SCCP producers;

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4 Cronor's (1997): **Substances Hazardous to the Environment**, Kingston upon Thames.

5 Although the Technical Guidance Document for the preparation of risk assessments does not require that the hazards posed by the substance of concern are placed into this wider context, it is considered to be useful in effectively communicating the nature of risk.

- 'formulation' of SCCP-containing leather processing products could release 7,800 kg of SCCPs per year into waste water across Europe; and

- use of SCCP-containing products for leather processing may result in emissions to waste water of 19,500 kg per year across Europe.

The risk assessment assumes that these emissions will be to sewer and diluted by a factor of ten following discharge from sewage treatment plant. Furthermore, the treatment plant is assumed to have an inflow of 2,000 m^3 per day and uptake of SCCPs onto sewage at the plant is assumed to be 93%.

The risk assessment concludes that the ratio between predicted environmental concentrations (PEC) and predicted no effect concentrations (PNEC) for the aquatic, sediment, terrestrial and secondary poisoning compartments are as set out in Table 2(a). In all cases, the ratios are >1 and so risk reduction measures are required.

Table 2(a): Worst Case PEC/PNEC Ratios for Releases of SCCPs from Formulation and Use in Leather Processing for the Water, Sediment, Terrestrial and Secondary Poisoning Compartments

Compartment	Release Step	PEC/PNEC Ratio
Water	formulation[a]	124
	formulation & use[b]	154
Sediment	formulation[a]	1400
	formulation & use[b]	1740
Terrestrial	formulation[a]	3875
	formulation & use[b]	4813
Secondary Poisoning	formulation[a]	1.6
	formulation & use[b]	2.6

Notes: (a) based on formulation Scenario A
(b) based on formulation Scenario B, where releases from both formulation and use are equal

Source: BRE (June, 1997): *Draft Risk Assessment on SCCPs*, Section 3.3

v) degree of uncertainty in the results of the Risk Assessment

The results of the risk assessment are uncertain in that:

- the effects of SCCPs on soil and sediment dwelling organisms is based on the equilibrium partitioning method which indicates a risk that has not been verified;

- the manner of formulation and use of SCCP-containing leather processing products is not fully established in the risk assessment; and

- due to this overall lack of data it has been necessary for the risk assessment to rely on the use of assumptions.

With respect to the last point, the opportunity of closer analysis offered by this study has found some of the assumptions used in the risk assessment to be unrepresentative of the current patterns of formulation and use of SCCP-containing leather processing products. These include the following:

- consultation for this study has identified that there may be only three formulators of SCCP-containing leather processing products in Europe. One of these is known to simply re-label the barrel containing SCCPs and so does not release SCCPs to waste water via formulation;

- the risk assessment contains a scenario (A) which suggests that all SCCPs supplied to formulators from European producers (390 tonnes per annum) are sulphonated and so risks from SCCPs are not present following formulation. Consultation with BRE has suggested that this is now known not to be the case;

- the risk assessment contains a second formulation scenario (B) where it is assumed that all 390 tonnes of SCCPs are mixed with 390 tonnes of sulphonated compounds to result in mixtures of 50:50 SCCP:sulphonated compounds. This results in risks arising from the release of SCCPs from tanners during use. Consultation with industry for this study suggests that SCCPs are used at tanneries at 100% concentration; however these data would not alter the overall conclusions of the risk assessment; and

- the risk assessment bases its calculations on 1992/93 data relating to the supply of SCCPs from European producers to fatliquor formulators. It is assumed that all 390 tonnes supplied are also used within Europe. In contrast, the actual use of SCCPs for fatliquoring in Europe in 1996 was between 100 and 150 tonnes. Thus, actual European use may be between one third and one quarter that implied in the risk assessment and the resulting environmental risks from tanneries may also be between one quarter and one third less than those predicted[6]. However, it is estimated that environmental concentrations would still fall above the PNEC of 0.5μg/l, thus requiring risk reduction options to be considered.

From this it is clear that a lack of data about formulation and use of SCCP-containing leather processing products has led to the use of default values and assumptions in the risk assessment. However, a reworking by BRE of the PEC calculations for formulation and use in accordance with the above data indicates that, although the PEC/PNEC ratios for the aquatic compartment are lower than those set out in Table 2(a) above, these are still high enough to require risk reduction.

6 The calculations undertaken by BRE have been reworked assuming that use by tanners is between 100 and 150 tonnes per annum rather than 390 tonnes per annum but with all other factors remaining equal.

3. CURRENT RISK REDUCTION MEASURES

PARCOM Ban

In June 1993, PARCOM published a proposal to phase out the use of SCCPs, however this was rejected as it failed to raise the necessary support from signatories. In 1995, the proposed ban on the use of SCCPs was accepted by PARCOM signatories and deadlines were set for the phase-out of the use of SCCPs in paints, coatings, sealants, rubber, plastics and textiles as well as metalworking fluids. However, the use of SCCPs for leather processing does not appear to have been recognised in the PARCOM ban.

Belgium, Denmark, Finland, France, Germany, Ireland, the Netherlands, Norway, Portugal, Spain, Sweden and the UK are all signatories to PARCOM, as is the EU as a whole. The PARCOM Decision 95/1 has not yet been implemented by these Member States on the basis that it requires a decision from the EU concerning the approach which should be adopted in meeting the ban.

Voluntary Agreement

In response to the 1993 proposals by PARCOM for a phase out of the use of SCCPs in certain applications, the two European producers of SCCPs, represented by Euro Chlor (the European chlorine manufacturers association), proposed a voluntary phase out of production. The members of Euro Chlor represent around 95% of European consumption of SCCPs. These proposals were agreed by PARCOM in 1994 but the PARCOM ban was still upheld. In response, Euro Chlor strengthened aspects of their voluntary phase out. A meeting of DGIII in 1995, however, concluded that the Euro Chlor initiative could not be considered due to it being (i) potentially anti-competitive and (ii) non-inclusive of imports. In addition, CEFIC lawyers queried the legality of producers agreeing to withdraw a product from the market. As a result, the agreement was not formally pursued.

The members of Euro Chlor have attempted to encourage the formulators using SCCPs towards other substances, such as medium chain length chlorinated paraffins (MCCPs; with chain length $C_{14\text{-}17}$). One of the formulators appears reluctant to do so possibly due to the price difference, but others have stated that they are able to use other alternatives as and when required. From this it appears that any further reduction in SCCP use for leather processing products will require legislation.

Voluntary Labelling of SCCPs

About 18 months ago, members of Euro Chlor provisionally labelled SCCPs as “Dangerous For the Environment” in response to the Draft Directive on preparations. Producers have not found that the sales of labelled SCCPs have declined as a result.

Controls on Emissions to Water

The risks outlined in Section 2 stem from emissions to the local aquatic environment in all cases. These result from waste disposal via drains. Thus, any measures currently in place which control discharges to sewers and surface waters will impact SCCP emissions. National legislation aimed at controlling such discharges is outlined in Box 3, overleaf, for Belgium, Denmark, Finland, France, Germany, Ireland, the Netherlands, Italy, Portugal, Spain and the UK. All these Member States have a means by which discharges to surface waters can be regulated either centrally or by local authorities in response to developments at an EU level.

Box 3: The Control of Discharges to Sewers and Surface Waters in Belgium, Denmark, Finland, France, Germany and Ireland (Source: Mumma, 1995)

Belgium: General quality standards have been laid down for public water. Quality standards and treatment requirements have been set-up by the federal authorities. More detailed (and restrictive) provisions have been laid down by the Flemish and Walloon Regions. Federal legislation imposes a general prohibition on discharging any object or substance into public water. However, permits can be obtained from communal authorities in Brussels (or the regional authorities) for discharges of sewage and waste water into public waterways. General and industry specific conditions are attached and further individual conditions may be imposed depending on local water quality and the presence of other polluting industries. The tendency has been to impose stricter individual conditions on industry and companies. Industries can either treat their own sewage or arrange for it to be treated by the water companies (in which case they must contribute to the cost of so doing).

Denmark: The Environmental Protection Act governs the pollution of water. There is a general prohibition against the discharge of substances which can pollute surface water. However, the regional council may permit the discharge of specified substances. As a result of the prohibition on discharges to surface waters, connection to the public sewerage system is obligatory.

Finland: The Water Act 1961 (as amended) provides for a permit procedure based on prohibitions against the pollution of waterways. Any activities which result in non-compliance with these prohibitions require a permit. Permits are only issued under certain conditions including a requirement that the activity will not cause perceptible and harmful changes in the environment. Sewage discharge permits, which may be revoked or revised, are normally issued for a specific period of time. The permit may include conditions or requirements on, for example, allowable waste load and required water treatment and the maintenance of treatment facilities.

France: Water pollution is regulated by the law of 16th December 1964 and by the New Water Act of 3rd January 1992. An *arrêté* dated 1st March 1993 regulates discharges by authorised classified facilities. The 1992 Act defines general objectives for the protection of water quality and institutes a system of authorisations and declarations. An authorisation is granted by a *préfet* and the duration of the permit and any technical prescriptions are specified.

Germany: The control of water pollution is governed by the Water Management Act. This is Federal law supplemented at *Land* level. Surface waters may be utilised to the extent customary in the relevant *Land.* The *Länder* are responsible for producing regulations as to water cleanliness. Under the Water Management Act, discharges of solid or liquid substances into surface waters requires a licence. This will be refused for liquid discharges if the toxic content is not maintained below levels set out in the relevant Regulations or as low as current technology allows. Those who release effluent above a given daily threshold are to appoint a water resources protection officer to see that regulations are adhered to. Under the 1976 Waste Water Contribution Act, contributions are set for the discharge of effluent into certain waters according to its nature. This economic instrument aims to protect the environment and encourage “cheaper” disposal methods.

Ireland: The principal legislation consists of the Local Government (Water Pollution) Acts 1977 and 1990 and the 1978 Regulations. The local authority can grant an effluent discharge licence permitting discharges to waters and sewers. For processes associated with integrated pollution control, the licensing function has been transferred to the Agency. The Minister of the Environment is empowered to prescribe various quality standards which are incorporated by Statutory Instrument into Irish legislation. A local authority uses these, WHO or other international standards in determining "safe" contaminant levels.

Box 3: The Control of Discharges to Sewers and Surface Waters in the Netherlands, Italy, Portugal and Spain (Source: Mumma, 1995)

Netherlands: The main legislation regulating discharges to surface waters is the Pollution of Surface Waters Act (1969) which distinguishes between direct discharges to surface waters and indirect discharges (usually to the municipal waste water system). 76/464/EEC has been implemented under the Act and Daughter Directives are implemented by decrees which set limit values for the substances concerned. In general, a licence is required for any discharge direct to surface waters; the Minister of Transport, Public Works and Water Management is the competent licensing and enforcement authority for major national waterways. For direct discharges to other waters, the water quality management agencies (the provinces of Groningen and Utrecht and 28 water boards) are the competent authorities. Licences may set limits on discharges of specific pollutants or prescribe specific techniques, technologies or materials which must or may not be used. In principle, discharges to sewer do not necessarily necessitate a licence under the Act and are normally regulated by municipal discharge ordinances. However, a licence under the Act is required for categories of establishment designated by decree, and decrees have designated some nineteen categories of establishment for which licences are required from regional water quality management agencies.

Italy: The protection of waters from pollution is provided for by the "MERLI" Law of 1976 and subsequent amendments. Regulation of discharges is associated with two basic principles: setting limits for what are acceptable discharges; and a system of authorisation for all discharges to be granted by the authorities responsible for controlling water. The law states that discharging systems should be easily accessible for testing and monitoring purposes. The Regions are responsible for maintaining controls on discharges. The Provinces entrusted to the Municipalities control and grant authorisations in respect of all discharges.

Portugal: Qualitative and quantitative limits for discharge of waste water are set out in various annexes to Law 74/90. These limits take account of the type of activity producing the waste water and the quantity of waste produced. Those disposing of waste water must obtain a licence from the National Water Institute and from the relevant Regional Directorate for the Environment and Natural Resources. The licence sets out the disposal limits.

Spain: The main legal framework is the Water Law 29/1985 and the 1986 Regulation on Public Waters (as amended). The regulation sets limits for the disposal of certain substances. Water Authorities are responsible for authorising discharges to “public waters”. The authorisation may have conditions attached to it. The granting of an authorisation is subject to a charge which is set according to how many “Units of Contamination” the discharge represents (the Unit depends on the type and volume of the pollutant and other factors). The Water Law also provides for the formation of "waste companies" to treat waste water produced by other industries.

the UK: Point source pollution is controlled through discharge consents where limits are set by Environmental Quality Objectives (EQOs), or Water Quality Objectives (WQOs). In 1989, the then Department of the Environment (DoE) introduced the Surface Waters (Dangerous Substances) (Classification) Regulations, setting EQSs for List I substances (seven years after the first Daughter Directive). By 1989, the DoE had also set EQSs for 15 List II substances. Numeric consents, specifying limits of effluent discharge, may be either absolute or percentile. Absolute limits must not be exceeded at any time while percentile limits needs to be achieved only for a given percentage of the time. For effluent to be discharged to UK sewers, a ‘trade effluent consent’ must be obtained.

At the EU level, discharges to the aquatic environment are controlled by the Framework Directive (76/464/EEC) on pollution caused by certain dangerous substances. This Directive sets up two lists of dangerous substances, List I (the "Black List") and List II (the "Grey List") and requires that discharges of listed substances are authorised and that emission standards for these discharges are laid down.

List I substances are those considered to be toxic, persistent or bio-accumulative in the aquatic environment. The Framework Directive specifies eight groups of substances from which List I substances should be identified, including "organohalogen compounds and substances which may form such substances in the aquatic environment" and "organophosphorous compounds". An individual substance only becomes a List I substance once specific controls have been set for that substance by a Daughter Directive.

Under the Framework Directive, Member States can opt for one of two approaches to the control of discharges of List I substances to surface waters:

- limit values: specified as maximum concentrations of the substance permitted in effluent and the maximum quantity which can be discharged over time. The latter must be observed, while the former, in principle, should not be exceeded. Where appropriate, limit values are specified for different types of processes or industrial sectors; and

- quality objectives: given for various bodies of water and sometimes for fish flesh. It is then for Member States to set emission standards so that compliance with the appropriate quality objective is achieved.

As Box 3 illustrates, only the UK has opted for the use of quality objectives; all other Member States have adopted limit values. The Framework Directive also requires emission standards to be set for discharges of List I substances to sewer "where this is necessary for the implementation of the Directive".

To take the UK as an example, in some instances the release of SCCPs to waste water and sewer may be controlled by default, depending on the approach adopted by the water company of concern. For example, it has been established that discharges of SCCPs to sewer are subject to one of five types of control:

- *limits on the concentration of total oils in discharges*. These vary by water company. For example, South West Water permit concentrations of <250mg/l, while for Wessex Water the limit is generally 200mg/l and for Northumbrian Water the limit is 400mg/l;

- *separate limits for vegetable or mineral oils*, with the latter for Thames Water being concentrations of 50mg/l;

- *a ban on the discharge of emulsified oils,* for example in the area controlled by Southern Water, where the high COD (Chemical Oxygen Demand) of water-mixed oils causes problems;

- *a ban on the discharge of free or floating oils* (for example neat oils), but no controls on emulsifiable oils; and

- *a ban on the discharge of oils of any kind*, for example Severn Water covering Greater Birmingham, the Black Country, Solihull, Tamworth and Lichfield.

List II substances are those which can have deleterious effects on the aquatic environment and the Framework Directive specifies 29 such groups. Member States are required to establish programmes to reduce pollution by List II substances and to set deadlines for their implementation. All List II substances are controlled by environmental quality objectives (EQOs) which are set by Member States in accordance with existing Directives. Emission standards are then set for each discharge of the List II substance. Unlike List I substances, authorisations for discharges of List II substances to sewer are not required under any circumstances (although in the UK, discharges to sewer are consented).

As the above discussion indicates, although mechanisms for controlling SCCP releases to water are available, the release of SCCPs is not specifically controlled. The effects of categorising SCCPs as a List I substance under the Framework Directive are considered in the following section.

4. POSSIBLE FURTHER RISK REDUCTION MEASURES

From the data presented in the *Draft Technical Guidance Document on Development of Risk Reduction Strategies* (16 May 1997) and experience with the proposed control of SCCP releases from metalworking facilities, the following risk reduction measures are considered:

- classification and labelling of SCCP-based products as "Dangerous For the Environment";
- restrictions on marketing and use; and
- limit values on emissions and effluent monitoring.

Classification and Labelling

The European Directive on Classification, Packaging and Labelling of Dangerous Substances (67/548/EEC) serves to ensure that Member States:

- notify substances using the European Inventory of Existing Commercial Substances (EINECS) or the European List of Notified Chemical Substances (ELINCS);
- assess the potential risk to humans and the environment associated with notified substances; and
- classify, package and label substances considered as dangerous for humans or the environment.

A substance should be classified under the Directive where it is deemed to be explosive, oxidizing, flammable, very toxic, harmful, corrosive, an irritant, sensitizing, carcinogenic, mutagenic, toxic for reproduction or dangerous for the environment. The Directive requires that Member States ensure that dangerous substances are not marketed unless their packaging has been labelled with details of :

- the name of the substance, using one of the designations given in the Directive;
- the notifier;
- the symbols indicating the danger involved in the use of the substance;
- danger symbols indicating the specific risks arising from use of the substance;
- danger symbols relating to safe use of the substance; and
- the EEC number of the substance obtained from either EINECS or ELINCS.

If SCCPs were identified as requiring the "Dangerous For the Environment" label, then they would be labelled with the appropriate symbol, plus the risk phrases R50 (very toxic to aquatic organisms) and R53 (may cause long-term adverse effects in the environment).

Mixtures of substances (i.e. preparations) are controlled by the Preparations Directive (88/379/EEC). This Directive requires that preparations are labelled where they pose a threat to human health, but does not require labelling where preparations pose a threat to the environment. In other words, while substances themselves must be labelled as "Dangerous For the Environment" if their properties require this, preparations containing those substances need not display such labels. Thus, there is as yet no mechanism for classifying and labelling leather processing products which are a mixture of SCCPs and other substances on the basis of their environmental hazard.

Marketing and Use Restrictions

Under the EC Directive 76/769/EEC, restrictions on the marketing and/or use of SCCP-containing leather processing products could be introduced in a variety of manners, including:

- banning the use of SCCPs in all or specified products;
- derogations for specified products or uses;
- phasing in restrictions;
- restricting the concentration of SCCPs in preparations; and
- labelling SCCP-containing leather processing products.

A total ban on the use of SCCPs for all leather processing would ensure that environmental risks stemming from release via this pathway would be eliminated. At the outset of the study it was decided that if industry highlighted that the risks or costs arising from a ban were significant, then alternative methods of restricting marketing and use would be considered. As this has not occurred, this study only considers a total and immediate ban on the use of SCCPs in all leather processing products.

Limits on Emissions

The regulatory frameworks for controlling emissions of substances to sewer and surface water were outlined in Section 3. Basically, SCCPs could be controlled by being classified on List II of the Framework Directive. This would ensure that EQOs would be set by Member States and that national programmes of control would be implemented. However, given that the results of the risk assessment suggest that SCCPs could be classified as toxic, persistent and able to bio-accumulate and given that they would fall under a category listed for control as a List I substance (organohalogen compounds), it appears that SCCPs should be proposed as List I substances.

5. ASSESSMENT OF POSSIBLE FURTHER RISK REDUCTION MEASURES

Table 5 summarises the risk reduction measures according to their likely effectiveness, practicality, economic impact and 'monitorability', as stipulated in the *Draft Technical Guidance Document on Development of Risk Reduction Strategies* (May, 1997). More discussion is provided below.

Table 5(a): Comparison of Risk Reduction Measures			
	Classification and Labelling	**Marketing and Use Restrictions**	**Limits on Emissions**
Likely Effectiveness	ineffective	immediately very effective	short/mid-term: partially effective long-term: effective
Practicality	impractical	very practical	partially practical
Economic Impact	low	low	potentially significant
Monitorability	good	good	difficult and costly

Classification and Labelling

i) Likely Effectiveness

In order for environmental risks to be reduced through classification and labelling, users of SCCPs and SCCP-containing leather processing products would have to respond by either using less of the SCCP-containing product, or by changing their disposal methods.

Due to the lack of legislation requiring the classification and labelling of preparations containing SCCPs, any leather processing product containing a mixture of substances would not be required to carry a "Dangerous For the Environment" label. Thus, tanners using SCCP-containing leather processing products would be unaffected by this measure. In addition, for those tanners using neat SCCPs, consultation clearly indicates that if "Dangerous For the Environment" appeared on such products, consumption practices would remain unchanged.

As mentioned in Section 3 above, in response to the Draft Directive on preparations, members of Euro Chlor (representing 95% of EU SCCP sales) introduced provisional classification and labelling of SCCPs as "Dangerous For the Environment" about 18 months ago. Producers have not found that sales of these products have declined. Thus, formulators of SCCP-containing products have apparently not responded to voluntary labelling.

It is considered that the classification and labelling of SCCP-containing leather processing products as "Dangerous For the Environment" would have little impact on the disposal of waste containing SCCPs from formulators and tanners. Given that formulators and tanners are expected to currently dispose of SCCP-containing waste in the most cost-effective manner, it is considered that more expensive or more time-consuming alternative methods would not be undertaken unless the facilities were legally required to do so.

As a result of the above, the classification and labelling option is considered to be ineffective at reducing environmental risks from SCCPs used for leather processing..

ii) Practicality

It is considered that classification and labelling of SCCP-containing leather processing products is impractical to a large degree due to the lack of the necessary implementing directive.

iii) Economic Impact

As the European producers of SCCPs have already voluntarily labelled SCCPs, the costs of additional labelling is considered to be low and the impacts to the price of SCCP-containing leather processing products is expected to be insignificant.

iv) Monitorability

As the labels would be clearly displayed on all SCCP containers, it is expected that monitoring would be straightforward.

Marketing and Use Restrictions

i) Likely Effectiveness

Marketing and use restrictions would ensure that the environmental risks posed by the release of SCCPs from production, formulation and use in leather processing would be eliminated. However, this goal would not be achieved if the leather processing industry could source SCCPs through means other than the traditional supplier[7].

Alternatives to SCCPs have been listed as any natural animal, vegetable or mineral oils, such as: MCCPs and longer chain length chlorinated paraffins; animal oils which are usually derived from beef tallow; vegetable oils such as corn, soya, palm, and to some extent rapeseed. The concensus is that MCCPs pose lower risks to the environment and human health than SCCPs. Given the nature of other alternatives, this is likely to be the case for these also. Thus, a ban on the use of SCCPs for leather processing will reduce risks overall.

ii) Practicality

The implementation of marketing and use restrictions would be through an amendment to Directive 76/769/EEC. It is expected that this would result in a top-down response whereby production of the substance for the specified use would cease, and so the products containing the substance of concern would no longer be available. This has been a standard and effective approach to controlling the risks from a wide range of substances and it is expected that practical methods for implementation have been devised by Member States.

[7] Consultation for another similar study has suggested that where a traditional supply route is interrupted, then supply is simply sought from non-traditional routes. For example, if SCCPs were no longer supplied for use with leather but were supplied for use with woven fabrics, then a tanner may simply buy SCCPs from a textile supplier or fabric treatment facility instead. However, it is expected that this would increase the price of the SCCPs as an additional link in the chain of supply would emerge and there would be risk attached to supplying the substance. As it appears that SCCPs are used simply as volume enhancing agents for low grade fatliquors and for no other purpose, it is expected that where the price of securing SCCPs in this way matched that of alternatives, the former would cease to be used. In any case, given the risk involved with securing supplies in this way and the lack of performance-related benefits from so doing, it is expected that this practice would not be undertaken.

iii) Economic Impact

The use of SCCPs for fatliquoring is to add bulk to low grade products. The main reason for this use being that SCCPs are readily available at a reasonable price. It has been confirmed by COTANCE (the Confederation of National Associations of Tanners of the European Community) that SCCPs' "function in leather processing appears to be not crucial". Furthermore, other consultees have stated that the performance benefits of SCCPs for fatliquoring are "zero" as they confer no fatliquoring properties. The reason for this is that the hydrocarbon chain lengths are too short; anything less than around $C_{14\text{-}16}$ does not offer any fatliquoring properties. As such, this study has not identified any quality reductions from removing SCCP-containing leather processing products from the market. However, it has been suggested that the alternative substances may have stronger odours and so the aesthetic quality offered by SCCPs may not be matched by alternatives, but no tanner has highlighted this to be a problem.

From data provided by CEFIC, there appear to be three formulators of SCCP-containing fatliquors in Europe; one in the UK, one in Germany and one in Italy. It appears that about 1% of European supply of SCCP-containing fatliquors is from the UK formulator, 77% of supply is from the Italian formulator and 22% is from the German formulator. It is known that the UK formulator also supplies alternatives and does not expect to lose sales if it was stopped from supplying SCCP-containing fatliquors. This is also expected to be the case for the formulators in Germany and Italy, but if sales were lost then, relatively, impacts to these Member States would be greatest.

A 'formulator' of SCCP-containing fatliquors stated that the movement from these products to alternatives may cost tanners in the region of £200 per tonne of fatliquor (an increase of around 15%). As there are expected to be between 100 and 150 tonnes of SCCPs per annum used by tanners for fatliquoring across Europe, this is equivalent to increased fatliquor costs of between £20,000 and £30,000 per annum for all tanners in Europe.

Table 5(b) sets out the distribution of tanners in each Member State. If this distribution is taken as an indication of the likely spread of use of SCCP-containing leather processing products, then the associated impacts may also be similarly distributed. Thus, impacts to Austria, Belgium, Denmark, Finland, Greece, Ireland, the Netherlands, Norway and Sweden would be almost zero. France, Germany, Portugal and the UK would share similar impacts of around £2,000 each. Spain would experience marginally higher impacts at around £3,500 while Italy would experience the highest economic impacts of about £8,000. As an average cost to all tanners this represents economic impacts of about £15 each. It is, however, highly unlikely that costs will be distributed evenly across all tanners. For example in the UK, only one user of SCCPs has been identified (out of the 126 tanners) and the cost to this tanner from moving to alternatives could be around £200 per annum.

Consultation has suggested that UK use of SCCPs for leather processing is one fifth that of Spain, and Italian use is twice that of Spain. Using these ratios and what is known to date for the UK, it appears that costs to Spain could be £1,000 and costs to Italy could be £2,000. This leaves between £16,800 and £26,800 unaccounted for across Europe.

It was considered that perhaps small tanners with low profit margins would be unable to absorb a 15% increase in the price of their fatliquors. They may, for example, be more significantly affected by marketing and use restrictions than larger tanneries if they have been using SCCP-containing leather processing products to keep their costs low. However, consultation with a small tanner (i.e. one with less than 50 employees) has indicated that the cost of purchasing SCCPs (used at 100% concentration) is 0.525% of their annual turnover arising from sales of the associated leather.

Table 5(b): Number and Size of Tanners in Each Member State

Member State	Number of Tanners	Proportion of Total in EU	Distribution of Small, Medium and Large Tanners by Member State in terms of Employee Numbers[A]		
			Small: <50	**Medium: 50-250**	**Large: >250**
Austria	15	0.97	50%	17%	33%
Belgium	14	0.90	70%	30%	-
Denmark	2	0.13	-	100%	-
Finland	14	0.90	75%	25%	-
France	179	11.54	75%	23%	2%
Germany	139	8.96	64%	30%	6%
Greece	25	1.61	60%	30%	10%
Ireland	9	0.58	60%	40%	-
Italy[B]	572	36.88	77%	20%	3%
The Netherlands	44	2.84	78%	22%	-
Norway	5	0.32	34%	66%	-
Portugal[B]	115	7.41	47%	43%	10%
Spain	285	18.38	69%	24%	7%
Sweden	7	0.45	100%	-	-
the UK	126	8.12	58%	36%	6%
TOTAL for EU	1551	*100%*			

Notes: A Not all entries in the source document indicated their number of employees; the presented data accounts for the size of between 50% and 80% of tanners (varying by country).

B A considerable number of tanners did not indicate number of employees, the majority of these having company names which appeared to be the names of people. This may mean that small companies are not adequately represented.

Source: Miller Freeman plc (1997): **International Leather Guide - 1998**

Thus, a 15% price increase for alternatives to SCCPs would be insignificant (the 0.525% increasing to around 0.6%). The resulting increase in the price of leather and leather goods would be similarly insignificant. Overall, it can be concluded that the economic impacts of introducing marketing and use restrictions to all links in the chain of trade would be very low.

iv) Monitorability

If the use of SCCPs in all applications is phased out across Europe, then checking imports would suffice to ensure that SCCPs are no longer used in leather processing products. If SCCPs are derogated for use in some applications then monitoring may be required. That said, it is considered that:

- as it is expected that SCCPs' greatest application (in metalworking fluids) will shortly be restricted, SCCPs will become less abundant;
- as SCCPs become less abundant it is expected that their price will increase;
- as the only identified significant benefit from using SCCPs for fatliquoring is their low price, any price increase would render them unpopular for this application; and thus
- demand for unauthorised use is expected to be low if at all present.

Limits on Emissions

i) Likely Effectiveness

As indicated above, in order to control emissions of SCCPs to surface waters, it is expected that SCCPs would have to be classified as a List I substance under the Framework Directive. Member States could opt for setting limit values or establishing and maintaining EQOs. In theory, if this option were adequately implemented and monitored, it would ensure that concentrations of SCCPs reaching surface waters would be reduced to levels below an agreed limit of concern. Not only would SCCPs released from use in leather processing be controlled, but so would releases from all other uses.

Despite the above, around 30% of all industrial facilities in the EU are not connected to sewer and so discharge directly to the environment. Unless these discharges are controlled, they have the potential to enter surface waters untreated and cause environmental damage. The proportion of discharges which remain uncontrolled is not known. For this option to be 100% effective, all unconnected facilities would need to be identified and their discharges of SCCPs restricted. Even if all facilities were connected to sewer, the effectiveness of this option is heavily reliant upon monitoring capabilities.

ii) Practicality

Once a substance has been categorised as List I under the Framework Directive, there are significant delays in implementing appropriate Daughter Directives. Of the original 129 substances on List I, less than 29 Daughter Directives have to date been instigated; thus, more than 100 potential List I substances are currently controlled as List II substances.

The implementation of this option is dependant upon the development of an EQO for the UK and limit values for other Member States. Based on data in the risk assessment it appears that an appropriate EQO may be between 0.1 μg/l and 0.5 μg/l. That said, from previous work undertaken on options to control risks posed by SCCPs in metalworking fluids, an appropriate level is difficult to determine.

Despite these difficulties, if the option were to be adopted and these problems overcome then impacts would be expected to fall on water treatment facilities in the first instance. Their first option would be to blend incoming discharges in order to reduce the overall concentration of SCCPs being treated in the plant. Where this does not reduce concentrations sufficiently, those formulators and/or tanners

discharging SCCPs to sewer and surface waters would be required to limit their emissions and they may chose to do so by either:

- making improvements to the storage, handling and use of SCCP-containing products;
- installing pre-treatment systems and/or altering disposal routes; and/or
- seeking alternative products.

They may also choose to adopt a combination of these approaches.

Given that current handling, use and disposal methods are likely to be the most cost-effective for each formulator and tanner, the first two options would probably incur costs[8]. If these costs were higher than the expected 15% cost increase for alternatives, then it is expected that the third option would be chosen. This option is expected to be chosen in most cases.

iii) Economic Impact

Formulators and tanners may be able to determine by proxy whether the concentrations of SCCPs in their effluent would be below any stipulated limit value (by, for example, gauging their estimated disposal to drain concentrations based on known consumption). If not, the equipment that would be required for testing compliance would be costly. Consultation has suggested that to purchase the necessary effluent testing equipment (such as a gas chromatographic mass spectrometer) would cost a minimum of £20,000, in addition to the high running and sampling costs.

If formulators and tanners were to seek alternative disposal methods to ensure compliance with a limit value while continuing to use SCCPs or associated products, costs would also be expected to increase. Disposal costs to formulators and tanners are currently at the discretion of water legislators and are expected to be insignificant in most cases. From a related study on SCCPs used in metalworking fluids, it is known that disposal of SCCP-containing fluids to waste disposal companies may cost between £0.075 and £0.30 per litre (or between £75 and £300 per tonne). There are between 100 and 150 tonnes of SCCPs consumed in Europe each year for leather processing, and when used as fatliquoring agents, the SCCPs comprise around 20% of the total fatliquor volume. Thus, between 500 and 750 tonnes of fatliquor per annum may contain SCCPs and it is assumed that all of this volume is waste washings once fatliquoring is complete. Thus, disposal of SCCP-containing waste washings via waste disposal companies may incur annual costs of between £37,500 and £225,000 to European tanners. Costs to formulators cannot be estimated as the volume/proportion of SCCPs lost during formulation is unknown.

For a typical small tanner using 1 tonne of SCCPs per annum (taking a small UK tanner as an example), at 20% concentration this would make 5 tonnes of SCCP-containing fatliquor. Based on the above assumptions, disposing of these waste washings by a waste disposal company may cost this tanner between £375 and £1,500 per annum. Given that the 1 tonne of SCCPs may cost around £1,000, these disposal costs would potentially double the costs associated with using this substance.

It is possible for companies to reduce these waste disposal costs by installing gravity separation and ultra-filtration systems, which filter oil from water. These can reduce the volume of fluids which

[8] Consultation indicates that equipment required to test for compliance at each facility or to pre-treat effluent before disposal is expensive and so alternatives will be sought instead.

require disposal to commercial operators, and so can reduce associated costs. However, these units may cost in excess of £10,000.

As increased disposal costs would confer no determinable benefits to either the formulators or tanners, it is considered that these costs would not be acceptable and so companies would seek to use alternative fatliquoring agents. The discussion above with respect to marketing and use restrictions indicated that economic impacts from using alternatives would be insignificant, and this is also the case for moving to alternatives under limits on emissions.

iv) Monitorability

To test for SCCPs at the low concentrations causing concern would require expensive gas chromatographic mass spectrometer sampling equipment, costing in excess of £20,000 to install in addition to high running and sampling costs (£400 to £800 per test). To be effective, sampling would have to take place at sewage treatment works as well as receiving waters. Consultation for a related study on SCCPs suggests that this type of sampling is not commonplace. Thus, monitoring for compliance would be costly due to the requirement to install new equipment.

SCCPs are difficult to monitor for at the low concentrations of concern as they are difficult to distinguish from chlorinated paraffins of longer chain length. One of the more effective alternatives to SCCPs are MCCPs and these are apparently widely used in leather processing. COTANCE have expressed concerns that if SCCPs are tested for but cannot be differentiated from MCCPs then any resulting attempts to move away from using MCCPs would be very costly to the industry.

6. ADVANTAGES AND DRAWBACKS

At this point in the study it appears that the options can be ranked in terms of their effectiveness as follows:

1. Marketing and Use Restrictions (total and immediate ban on the use of SCCPs in fatliquors)
2. Limits on Emissions
3. Classification and Labelling

Both limits on emissions and marketing and use restrictions may potentially reduce the risks associated with using SCCPs for leather processing. The impacts of each measure are compared in Table 6(a) to clarify which option reduces the risks from SCCPs at least cost.

With respect to both options, where alternatives may be used in place of SCCPs, the most hazardous appears to be MCCPs (as set out in Section 5). Given that MCCPs are generally considered to pose less risk to the environment than SCCPs, the use of any alternative should result in net benefits to the environment and human health.

As Table 6(a) indicates, the costs from the limits on emissions option are at least £20,000 per new sampling unit required by regulators for monitoring and compliance purposes. Across Europe there will be at least 10 of these new units required, if not many more, and so associated costs may be in excess of £200,000 for regulation purposes alone. In addition, some tanners may incur costs in moving away from SCCPs to alternatives.

In contrast, the costs associated with marketing and use restrictions appear to relate only to tanners changing to alternatives, at between £20,000 to £30,000.

Table 6(a): Summary of Advantages and Drawbacks			
CRITERIA	**ALTERNATIVE CONTROL MEASURES**		
	CURRENT SITUATION	**LIMITS ON EMISSIONS**	**MARKETING AND USE RESTRICTIONS**
Environmental risk of the substance	Disposal of waste containing SCCPs from formulators and tanners to drain. Toxic to aquatic organisms and bioaccumulates.	In the short-term, current risks would continue. In the longer-term emissions would be controlled, so risks would reduce. Total elimination cannot be guaranteed due to connection and monitoring issues.	The current risks would be immediately and totally eliminated.
Environmental risk of the substitute	Alternative fatliquors currently being usedt appear to pose fewer risks than SCCPs.	Alternatives may be sought if less costly than limiting emissions. No specific environmental risks identified with available fatliquors. Alternatives appear to pose lower risks than SCCPs.	Alternatives would be sought. No specific environmental risks identified with available fatliquors. Alternatives appear to pose lower risks than SCCPs.
Health risk of the substance	None specifically identified.	None specifically identified.	None specifically identified.
Health risk of the substitute	None specifically identified	None specifically identified.	None specifically identified.
Cost or benefit to the producer	Two EU producers, phasing out SCCP production. No significant costs or benefits.	Two EU producers, phasing out SCCP production. No significant costs or benefits.	Two EU producers, phasing out SCCP production. No significant costs or benefits.

Table 6(a): Summary of Advantages and Drawbacks			
CRITERIA	**ALTERNATIVE CONTROL MEASURES**		
	CURRENT SITUATION	**LIMITS ON EMISSIONS**	**MARKETING AND USE RESTRICTIONS**
Cost or benefit to formulator	Three EU formulators. No costs. Benefits of market share relating to inexpensive fatliquor.	Would affect two EU formulators (one re-labels barrels), with four possible cost scenarios: 1) £20,000 sampling equipment each and no increased costs of alternatives (total £40,000); 2) increased disposal costs (unknown); 3) £10,000 separation unit and lower (unknown) disposal costs (at least £20,000); or 4) 15% increase in fatliquor costs (no R&D required) from moving to alternatives - would be handed on to tanner so no costs incurred. Last option most likely.	Would affect three EU formulators. Costs would increase by around 15% with move to alternatives but these would be handed on to tanners.

Table 6(a): Summary of Advantages and Drawbacks			
CRITERIA	**ALTERNATIVE CONTROL MEASURES**		
	CURRENT SITUATION	**LIMITS ON EMISSIONS**	**MARKETING AND USE RESTRICTIONS**
Cost or benefit to the user (tanner)	No costs. 100 to 150 tpa consumed in EU. Benefits of inexpensive fatliquor which remains viscous at low temperatures and has low odour. No fatliquoring properties conferred.	Costs related to ensuring compliance: 1) £20,000 sampling equipment each and no increased costs of alternatives (total unknown); 2) increased disposal costs (totalling between £37,500 and £225,000 across all tanners); 3) £10,000 separation unit and lower (unknown) disposal costs (total unknown); or 4) 15% increase in fatliquor costs from moving to alternatives (totalling between £20,000 and £30,000 per annum for all tanners). Potentially increased odour from alternatives. Potentially improved fatliquoring properties. Last option most likely for monitored tanners. Benefits of freedom to choose SCCPs if desired.	Costs of moving to alternative fatliquors: 15% price increase of between £20,000 and £30,000 per annum across all tanners. Potentially increased odour. Potentially improved fatliquoring properties.
Cost or benefit to the producer (formulators) of the substitute	Majority of fatliquors in use are the alternatives. No costs or benefits.	Majority of fatliquors in use are the alternatives. Three EU formulators also appear to sell the alternatives. No significant costs or benefits.	Majority of fatliquors in use are the alternatives. Three EU formulators also appear to sell the alternatives. No significant costs or benefits.
Other factors (administrative burden, employment, etc.)	Costs of monitoring: None	Costs of monitoring: sampling equipment would cost over £20,000 in addition to high running and sampling costs (£400 to £800 per test). This would need to be installed at many test sites to ensure compliance and risk reduction.	Costs of monitoring: Although the mechanisms are in place, installation of chemical-specific monitoring will be required. Costs are expected to be low.

7. FURTHER RISK REDUCTION MEASURES RECOMMENDED

Given the above findings, it seems clear that marketing and use restrictions will immediately and totally eliminate the risks associated with SCCPs used for leather processing. Marketing and use restrictions also appear to be the least cost option.

8. ORGANISATIONS CONSULTED

Data Received From:

BRE
BLC - Leather Technology Centre (British Leather Confederation)
Chlorinated Paraffins Sector Group of Euro Chlor (a major group within CEFIC)
Clariant UK Ltd.
COTANCE (Confederation of National Associations of Tanners and Dressers of the EC)
Euratex
Hodgsons Chemicals
Münzig Chemie gmbh (Germany)
UK Health & Safety Executive

Some consultees wished for their names to be withheld.
A response from COTANCE concisely summarises the key issues and concerns with respect to SCCPs used in leather processing. The association has agreed for their response to be included with this report and is reproduced in Annex 1.

No Data Received From:

Alpa Spa (Italy)
Asociacion de Investigacion de las Industrias del Curtido Y Anexas (Spain)
Centre Technique Cuir Chassure Maroquinerie (France)
CEC (European leather industry association)
Danish Technological Institute
European Textile Finishers Association
ICI SCCP Sales Representative in Italy

9. CONCLUSIONS

SCCPs are used in the wet dyeing phase of leather processing and are only used to add bulk to fatliquors. They have no fatliquoring properties because the chain lengths of the hydrocarbons are too short.

Data on the costs of SCCPs and alternatives have made it possible to develop some estimates of the economic impact of options for controlling the risks associated with SCCPs. This has enabled a more complete picture of the impacts from the proposed options to emerge than would have been possible with a purely qualitative analysis.

It appears that the only option which is certain to immediately and totally remove the environmental risks posed by SCCPs used in the fatliquoring of leather is marketing and use restrictions. Furthermore, a total and immediate ban on the marketing and use of SCCPs in the fatliquoring of leather would have insignificant impacts on formulators and tanners across Europe. The alternatives that would be used in place of SCCPs appear to pose less risks to the environment and are not expected to introduce new or increased risks to human health.

ANNEX 1:

RESPONSE FROM COTANCE