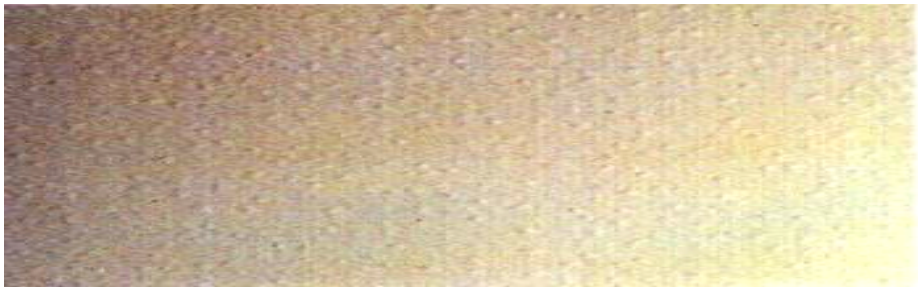
4. Blistering

DEFINITION: The creation of a bubble in the form of scattered pimples. Can be seen in both the undercoat or finish.



HOW CAN IT BE CAUSED?

1. Bad quality veneer. There is a possibility that the veneer has not dried well and as a result the smaller cavities have kept air. By applying the first coat, undercoat, air tends to come out on the surface. During his way out of the surface this creates transparent bubble sizes up to 3 mm, like the blister of soap form.

2. Poor dilution. There is a possibility that this phenomenon is being created when the viscosity of the material we use is too high. The air exiting the pore does not have the power to penetrate the flesh of the material due to its thickness.

3. Poor quality undercoat or finish. The material does not contain a sufficient amount of defoamer.

4. Different temperature between wood and undercoat. When the timber was stored in the sun, than after the application of the undercoat, the heated air will try to emerge to the surface.

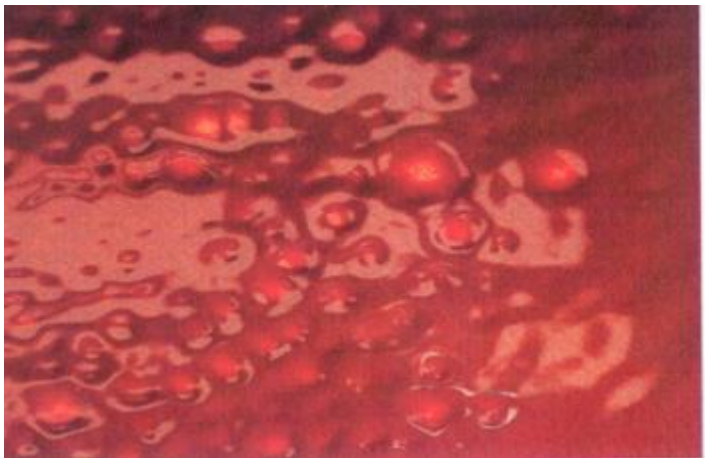
5. Used wrong hardener or thinner.

6. The hardener reacted with the humidity in the container.

TREATMENT: Sand well until all traces of the blistering disappeared and paint it again.

5. Silicone effect - Craters.

DEFINITION: Craters caused by the application of the undercoat or the final varnish, with the presence of silicone, oil or moisture within the air circuit. The silicone effect appears immediately during the application.



The presence of silicone or oil on the surface does not allow the undercoat or the finish to spread evenly and creates a crater.

HOW CAN IT BE CAUSED?

1. The presence of silicone or oil on the surface.

i) When we sweep the wood with a dirty cloth or cloth containing various commercial waxes such as Overlay, or other cleaning products etc.

ii) When you touch the wood with greasy hands or gloves. Even the natural fat of the skin may cause this effect.

iii) When we use silicone gloves.

2. Presence of humidity or oil in the air circuit.

3. Contaminated area with silicones.

i) When within the paint cabin, material containing silicone has been stored.

ii) When silicone particles are transported from our neighboring environment.

iii) When the filters of the cabin, the tripod support, tires, and generally all the objects inside the cabin and storage space are not cleaned regularly. And if those are infected either with silicone or fungi, (caused by long-term accumulation of overspray varnish).

4. Oily woods. There are some woods that create craters because they contain natural extract oil. These woods are usually synthetic LDF, MDF or HDF and artificial oak, and of course the Greek walnut, olive and mulberry.

TREATMENT

- Degrease the surface thoroughly where craters have been created.
- Sand the surface with craters lightly.

- Apply first a light coat and then the other coats. Leave enough time between them.

6. Opening of the stain.

DEFINITION: The phenomenon in which when you apply the water stain, transparent spots can be found locally. In those spots the stain has not painted the wooden surface.

HOW CAN IT BE CAUSED?

i) Existence of glue onto the surface. Many times the bonding of the veneer on MDF glue penetrates the veneer and comes to the surface without being visible to the eye.

ii) Varnish mist on the surface. The mist of the spray gun on the surface is a thin surface layer which prevents the penetration of the stain.

TREATMENT. In such minor problems we recommend the correction and with similar colored varnish (aniline).

7. Retreat

DEFINITION: It is the separation of the finish and the sealer for the wooden surface, because of insufficient hardening of the Selaer.

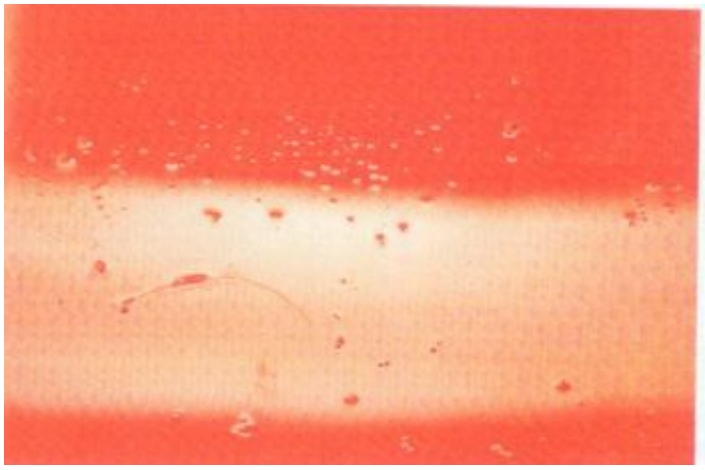
HOW CAUSED:

- Expired Hardener
- Incorrect mixing ratio.
- Violation of the waiting time between the undercoat and the topcoat.

TREATMENT. Sand well after drying well and apply the topcoat again. *Learn to wait.*

8. Dust.

DEFINITION: External particles from the air that fall onto the liquid film and are captured within and dried.



HOW CAN IT BE CAUSED?

- During the application, dust thrown from the recesses, arches or gaps from the panels.
- Dust that remained from the sanding of the surface.
- Dusty cloth with which we swept the surface.
- The mixture has dust.
- Our clothes are dusty.
- Walking around the furniture lifting dust, because the floor of the cabin is not dust free.
- The air filters of the cabin are blocked.
- The air hose is dirty.

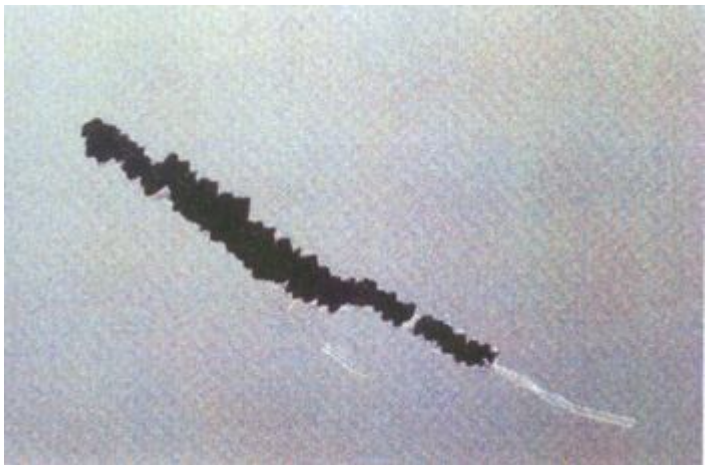
TREATMENT.

The dust can be removed with a pin during the spraying. If a small amount of dust has penetrated the varnish, it can be removed (after drying) with light sanding. If the dust is trapped deep into the paint we must have a sand good and apply the topcoat again.

- Blow to the wood with air and wipe with clean cloth before applying the final varnish.
- Blow thoroughly molds and clean the hair before you get into the cabin. In some cases is needed to wipe and mop the floor of the cabin.
- Replace filters after the specified time use by the manufacturer.

9. Detachment.

DEFINITION: It's the easy detachment of the last layer from the previous layer. This phenomenon can occur to both undercoat and finish.



HOW CAN IT BE CAUSED?

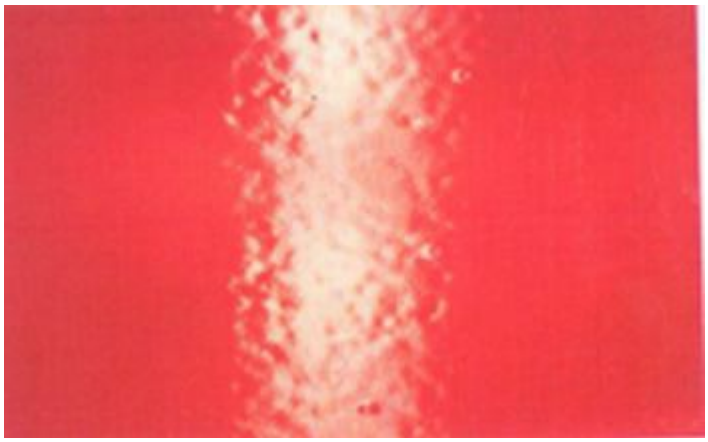
- An inappropriate product has been used.
- Some of the coats cannot ensure the proper adhesion thoroughly, due to dirt
- Insufficient or no sanding.
- Used wrong hardener or thinner. The thinner was very fast.
- Incorrect dilution.
- The diameter of the nozzle was too small or too big.
- The coatings were too thick.
- The spray temperature was too low or too high.
- The temperature of the sprayed surface was very low compared with the temperature of the material.

TREATMENT.

Sand the flimsy surface and apply again, properly this time.

10. Orange peel.

DEFINITION: Surface that has bad leveling and looks like orange peel.



HOW CAN IT BE CAUSED?

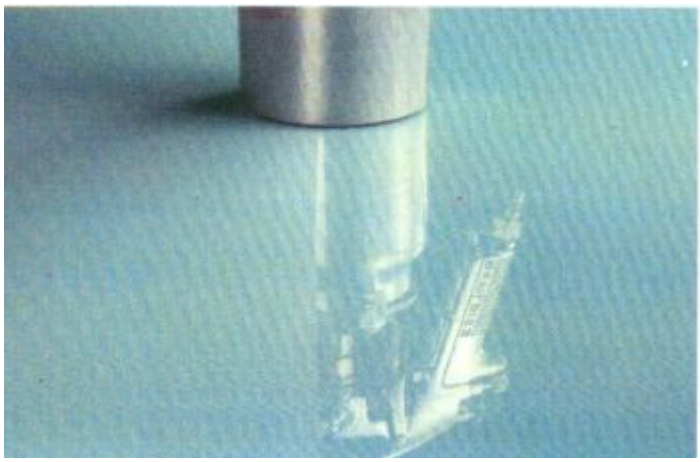
- The product viscosity was too high.
- The thinner was very fast.
- The air pressure was too high or too low.
- The beck was too big.
- The room temperature was too high or too low.
- The mixture temperature was very low.
- Thixotropic varnishes were used with insufficient dilution especially in summer.

TREATMENT.

Sand well after drying well and apply the topcoat again

11. Uneven sheen.

DEFINITION: Different sheens on the same surface. Called also “Oiled wood effect”.



HOW CAN IT BE CAUSED?

- Wax or water or something similar has been absorbed by the liquid varnish.
- The undercoat was not thoroughly dry before sanding.
- The undercoat was sanded with very coarse sandpaper.
- A very fast solvent has been used.
- Used wrong hardener or thinner.
- Incorrect mixing ratio.
- The drying temperature was too high.
- Insufficient supply of fresh air during the recycling of air.

TREATMENT.

Improving gloss with the use of special shining products. If this is not enough, then sand it well and apply again.

12. Cracking.

DEFINITION: The appearance of irregular breaks across the surface.

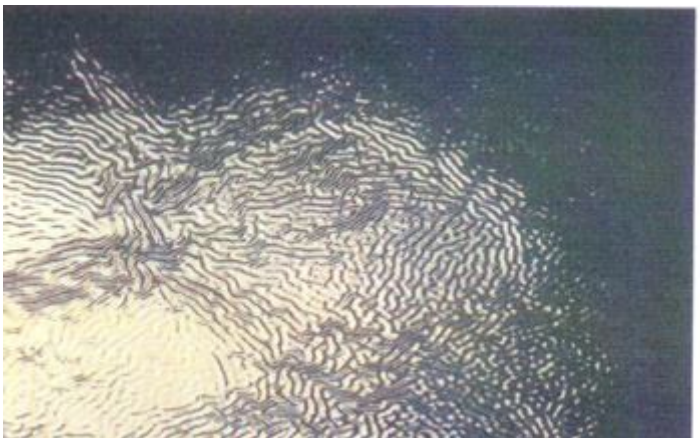
HOW CAUSED:

- Inappropriate product was used.
- Wrong hardener or thinner was used. The thinner was very fast.
- Incorrect dilution.
- The diameter of the beck was too small.
- The room temperature was very low.
- The temperature of mixture was very low.
- Defective hardener.
- Incorrect mixing ratio. We used more than the recommended ratio of hardener.
- The temperature of the surface painted was very low compared to the temperature of the varnish used.

TREATMENT.
Sand well after drying well and apply the topcoat again

13. Wrinkling

DEFINITION: The surface of varnish is wrinkled.



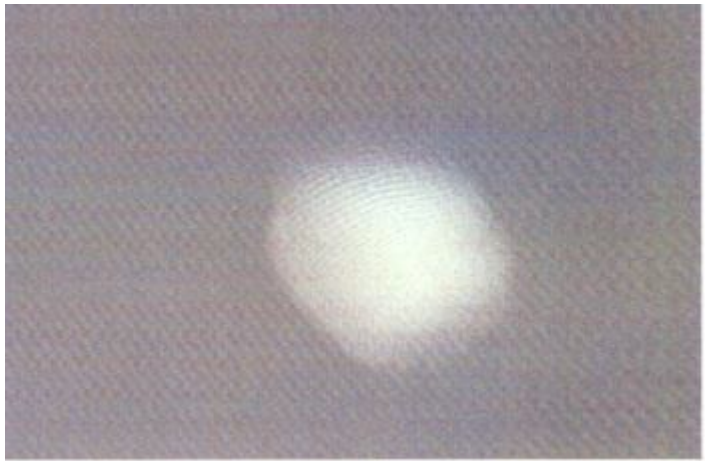
HOW CAUSED:

- Used wrong hardener or thinner.
- The varnish was applied to an undercoat that was not completely dry. Were not kept Proper waiting times where not followed.
- The varnish was applied very thick.
- The diameter of the nozzle was too big.

TREATMENT.
If the surface has light wrinkles, sand and repaint. If the surface has heavy wrinkles then remove the wrinkled surface with a paint remover and start the procedure from the beginning.

14. Insufficient drying.

DEFINITION: After some time the varnish coating is still soft. We can easily do lines with our finger.



HOW CAN IT BE CAUSED?

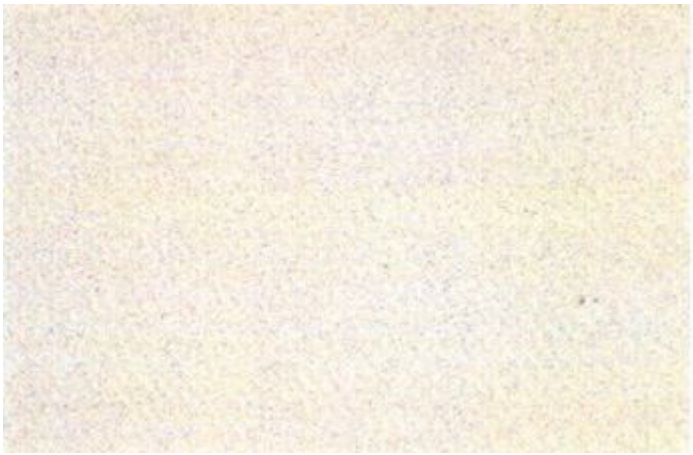
- The undercoat was oily.
- Incorrect hardener has been used.
- Wrong hardener has been added.
- Very thick application of paint.
- The room temperature was very low.
- The area was saturated with solvents. The air circulation was poor.

TREATMENT.

Dry the object for more time at the right temperature. If this does not help, remove soft coatings dissolving them with thinner or with sanding. Then repaint.

15. Mist.

DEFINITION: Mist falling on a surface just painted without beeing absorbed. The surface shows sandy due to the dry varnish particles that stick on it.



HOW CAUSED:

- A very fast thinner was used.
- The viscosity of the varnish was very high due to insufficient dilution.
- The air pressure was too high.
- The spray distance from the surface was very large.
- The nozzle was very small.

The spray gun was dirty or defective.

TREATMENT.

In most cases a light sanding is sufficient. **Paint the area again.**

16. Flowing.

DEFINITION: At some points where the thickness of the varnish is not the same, it has a hanged look, especially on vertical surfaces. The concentration of varnish in these points is so great that the varnish starts to flow while is still fluid.

HOW CAUSED:

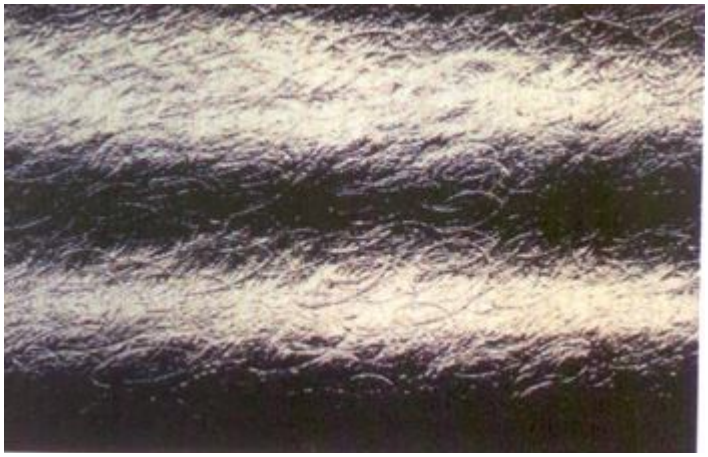
- The thinner was too slow for those temperatures.
- To much thinner has been used.
- The spray distance was very short; the varnish was applied unevenly causing local concentration of material.
- The very thick coating layer applied
- The work room was very cold.
- The varnish was not thixotropic.
- The varnish was too cold.

TREATMENT.

After drying completely, sand thoroughly and very careful the point of hanging, and apply varnish again.

17. Scratches from sanding.

DEFINITION: Thin scratches are visible on the surface of the varnish. The problem can occur either immediately or after a few days.



HOW CAUSED:

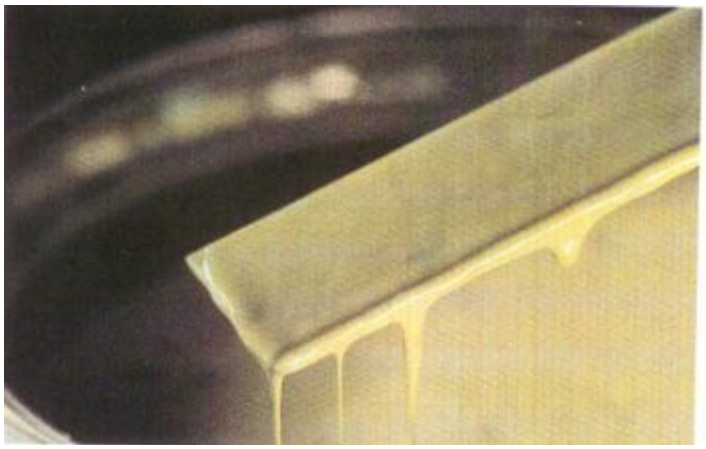
- Too thick sanding paper has been used.
- The undercoat was not completely dry during sanding.

TREATMENT.

After the varnish dries completely, sand properly this time and remove the varnish. In some cases, the grooves and snails are so obvious that you may need to recoat the surface with sealer.

18. Sediment.

DEFINITION: Some pigments, if the products are stored too long can fall to the bottom of the container due to their weight. Then varnish or lacquer has no longer a homogeneous mass.



HOW CAUSED:

- The life time of varnish or lacquer has expired.
- The varnish or lacquer was diluted and stored for a long time.
- The temperature at the storage was very low.

TREATMENT.

If the shelf life is not expired and the temperature has not drastically affected the quality of the material we can put the tank in a paint shaker and sake it well till it becomes swift again. Approximately 15 minutes in mixing machine is enough.

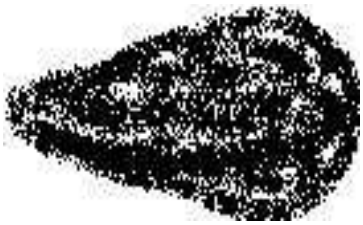
19. Problems with the spray gun.

DEFINITION: Many times the beam of the gun is not as it should be. It can for example target elsewhere and spray elsewhere the beam of the material. The material goes to other direction or is throwing as mist.

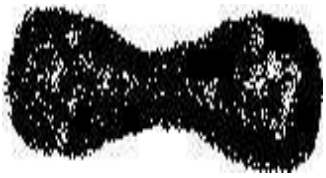
HOW CAN IT BE CAUSED?

One of the side holes of the nozzle is blocked. Then the fan will look like the following figure.

The nozzle needle is damaged.



The air pressure is too high.



The air pressure is too low.

TREATMENT.

First we dismantle the gun and clean it thoroughly with anti corrosive cleaner and then with thinner. Then we adjust the pressure to be between 2 and 3 Atm.

BIBLIOGRAPHY

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- Coatings Technology Handbook - Third Edition
- Paint Technology Handbook - R. Talbert CRC 2008
- Handbook of Chemistry and Physics - 85th ed. eBook

Appendix 2 – A review of the UK Environmental Protection Act 1990, Provided by Andy Hills, London Metropolitan University

(Note from Fellow – *Although this legislation was enacted some 13 years ago, it is still in force, and contains information pertinent to this Fellowship investigations and findings)*.

What is it?

Government legislation to control the emission of solvents into the air.

Who is affected?

Anyone who uses more than 5 tonnes if solvent per year.

Who will enforce it?

Large users like Ford, General Motors etc. Will be controlled by H.M.I.P

Small users like our customers will be controlled by the Local Authority.

When does it become effective?

The Enabling act will be in place by April 1991.

Guidelines to be issues November 1991.

Companies affected must register between April and September 1992.

Thereafter existing plant must comply not later than September 1998.

New plant must comply after September 1992.

Introduction

The ideal finishing system to meet the forthcoming pollution regulations should;

a) Be safe & environmentally friendly
b) Be cost effective
c) Produce an acceptable alternative finish in terms of resistance and appearance.
d) Use existing technology and proven finishing methods.

1) High Solids means low Solvent
   (Generally this varies from 3% to 30% solvent)
2) Types available:-

a) Acid Catalyst
b) Polyester
c) U/V cured products

Acid catalysed lacquers

1) General formulation details
   a) Unmodified
   b) Low carbon base solvents

2) Application techniques
   a) Automatic spray
   b) Drying oven – 'Stacker' type
      efficient air flow desirable

3) Necessary modifications
   a) Change nozzle tips – increase size
   b) Drying schedule – longer
   c) Line speed – slower

Advantages

a) Less solvent
b) Minimal disruption
c) Existing technology
d) Possible opportunity to meet requirements of Pollution Act

Disadvantages

a) Drying Schedule – longer
b) Line Speed – slower
c) Some modification may be required to oven
   - better airflow

Polyester systems

General formulation details: -

Fall into 2 categories

a) Low solvent
b) No solvent

Low Solvent

Possible to use up to 10% solvent and meet the requirements of legislation.

No Solvent

Right conditions of sure system should produce low monomer emission.

U/V Systems

Formulation details

a) Acrylic base
b) Styrene base

Generally the Acrylic route is favoured.

Very little solvents used.

Application methods

a) Automatic spray machine (carousel or traverse with heating facilities)
b) Roller coating. Dependant on shape of door.

Modifications for Automatic spray machine

a) Different nozzles
b) Diaphragm pump

Advantages

a) Very little solvent
b) Existing technology
c) Opportunity to meet important requirements of Pollution Act

Disadvantages

a) Longer drying schedule
b) Line speed slower
c) General modification of equipment
d) Design and appearance of substrate may have to be altered
e) Quality of finish will be different
f) Cost

Drying schedule:-

a) U/V Oven required
b) Very fast cure
c) Fast line speed

It is proposed that the maximum concentration of solvents in exhausted air will be 50 Milligrammes (carbon) per cubic metre

The carbon content of solvents varies.

(eg.) Ethyl Alcohol = 52%
Toluol = 91%

An efficient booth exhaust approximately 1,000 milligrammes per cu. metre.

The airflow would need to be increased by 20 times to reduce to 50 milligrammes.

Abatement

Two main alternatives

1) Absorption of the solvent vapour by sand
2) Recovery of the solvent by Adsorption techniques

Disadvantages

a) Disruptive – most changes
b) Heavy investment
c) Manufacturer may have to re-market appearance of finish
d) Cost

Abatement

1) Absorption of the solvent vapour by sand and thence reduction to carbon dioxide and water
    a) Initial installation costs high, precluding it to all but the largest installations.
    b) Cheap to run regenerating its own heat requirement.
    c) Running costs 0.005 KW/HR/M^3
    d) Claimed to be used at 120 installations.

2) Recovery of the solvent by adsorption techniques

    Two systems

    (A) Carbon Filter
    (B) Recyclable solvent

Process A (Carbon Filter): -

1) Condensation of solvent vapour.
2) Adsorption by carbon filter blocks.
3) Carbon filters withdrawn to extract solvent.

Process B (Recyclable solvent): -

1) Adsorption of solvent vapour by polyglycol solvent.
2) Steam condensation for recovery of solvent.
3) Recycling of polyglycol solvent.
4) System is automatic recycling.

Abatement

Conclusion

The recovery of solvent could be a viable system.

1) Recycling of solvent – environmentally friendly.
2) Cost. Cheaper than Water-borne.
3) Solvent recovery – could offset original plant cost.
4) Staying with technology we know well.

Amounts of solvent in a typical production plant

Booth No.	**Air Flow Cu metre/min**		**Lac. Consumption per min**	**Mg Carbon/cu metre**
	Cabinet	Oven		
Pigmented 1	220	100	400	1300
Pigmented 2	220	100	500	1570
Lacquer 3	220	100	500	1570
Lacquer 4	220	100	620	1950
Lacquer 5	220	100	420	1350
Lacquer 6	220	100	570	1800
Stain 1	220	100	600	1900
Stain 2	220	100	630	2000

High Solids

This is not normally feasible at 50 Mg/Cu. Metre

We are discussing this option with the Guidance notes compilers.

Water borne products

Advantages

1) No abatement required
2) Existing technology
3) Can be applied by existing plant
4) Can be cured in existing oven
5) Costs savings on thinners
6) No residual odour in the cured film
7) Healthy working environment

Disadvantages

1) Higher lacquer cost
2) Less tolerant in use
3) Doubts about Health & Safety of Aziridine cross linker
4) Less aesthetic appeal

Lacquer Cost Comparative Example

Acid catalyst lacquer at £ 1.80 per litre mixed (S.G. = 0.93)

Water-born lacquer at £ 2.80 per litre mixed (S.G. = 1.050)

Door area = 0.275 Square metres.

80 grammes per square metre – 4 coats, on face and 1 on back surface

$$= \frac{0.275}{80} \times 4 = 88 \text{ grammes per door}$$

Therefore: Solvent borne $= \frac{88}{930} \times £1.80 = 17.00p$

Water borne $= \frac{88}{1050} \times £2.80 = 23.50p$

Equates to an extra Extra 6.5p per door

Drying/ curing

Existing ovens can be used with possible adjustment to : -

1) Air flow

2) Temperature

To eliminate possible corrosion problems the inside walls may require coating.

Application method

Can be applied by Auto-spray with consideration to the following items being converted to stainless steel : -

1) Fluid like fittings
2) Connecting nipples
3) Distribution head of the spray cabinet
4) Spray gun fluid ways and needles
5) Fluid pump
6) Filters

Available water borne systems

a) One pack lacquers – similar to nitrocellulose
b) 2 Pack Acid Catalysed – low formaldehyde
c) 2 Pack using Aziridine crosslinker
d) Self crosslinking
e) Water borne U/V Acrylic Auto-spray lacquer

All except (a) meet BS6250 General Use requirements ((i.e.“Gold Award” for Kitchens)

Conclusion

Best options : -

a) Abatement

b) Water borne