SWANN CHEMICAL COMPANY

AROCLOR IN LACQUERS

We have a very good general lineup on the use of Aroclor in lacquers in the booklet which we have published for distribution. This booklet gives the limits of compatibility of Aroclors 1254 and 1262 in nitrocellulose lacquers. Since this booklet has been published a number of companies have started using Aroclor 1242 in special flexible lacquers such as are used on high tension cables, etc. The compatibility limits of Aroclor 1242 are higher than those of the higher chlorine Aroclors so that it is possible to incorporate enough of the Aroclor to give it extreme flexibility. You have the formula for Aroclor Lacquer No. 34 which gives the details of the use of this Aroclor in cable lacquer.

The work done in our laboratory using Aroclor in lacquers indicates that we get somewhat less chalking with the Aroclor lacquers than with those made up by other formulae. We get practical freedom from checking and cracking and, we believe, better color retention in the white and light colored lacquers. These are important considerations in lacquer manufacture, and Aroclor should be given much more consideration from now on for general use such as an automobile lacquer, etc. than it has received in the past because of the rising prices of other resins which are generally used.

We have a number of customers who use Aroclors 1242, 1254 and 1262 in the manufacture of lacquer.

LACQUER FORMULATION CHART

Non-Volatile Constituents:

1) A resin.
2) Nitrocellulose or cellulose nitrate.
3) A plasticizer or softener.

Volatile Constituents:

1) The alcohol constituent.
2) The ester constituent.
3) The hydrocarbon constituent.

Finished Lacquer:

X percent of the non-volatile.
(100 - X) percent of the volatile.

The percentage, X, of the non-volatile or film-forming constituents may vary between 20% and 30% of the weight of the finished lacquer.

Non-Volatile Constituents:

As has been shown by the table, the non-volatile components of a lacquer consist of a resin, cellulose nitrate and a plasticizer or softener. For the resin some one of those of synthetic origin may be employed, or a natural resin such as Gum Dammar may be used. Gum Dammar is a generally used resin in lacquer formulation, and it can be taken as the number one component. The number two component is the cellulose nitrate itself. It is also known as nitrocellulose, pyroxylin and "PX". To the industry in general it is "cotton". It can be purchased in two kinds, the AS and RS grades. The latter grade is the one that is

STLCOPCB4072149

chiefly used by lacquer manufacturers. The initials indicate a difference in the method of manufacture, AS meaning that the cotton is alcohol-soluble, and RS meaning that it is regularly soluble. Both grades are usually bought wet with denatured alcohol. The viscosity of the cotton is another determining factor with regard to its use. The cotton that is commonly employed by the industry has a viscosity of one-half second, and is known as "half-second cotton". For the third component dibutyl phthalate, tricresly phosphate, or castor oil may be used. At this point an explanation of the terms plasticizer and softener becomes necessary. The average lacquer technolgist uses these terms synonymously, and for this reason they have come to mean almost one and the same thing in this industry. Strictly speaking, a true plasticizer should be a solvent for the "cotton" and the resin. In addition it should have a low vaporization loss and should confer such properties as flexibility, pliability and durability on the lacquer film. Both dibutyl phthalate and tricresyl phosphate meet these requirements. Castor oil, on the other hand, does not, in that it is only a partial solvent for "cotton". It does, however, give to the film the qualities already mentioned, in short it exerts a softening effect, hence the name "softener". The difference then between a plasticizer and a softener is that the former is a true solvent for the non-volatile constituents of a lacquer, while the latter is a non-solvent, or at best only a partial solvent. Castor oil is typical of this latter class, and is widely used as a lacquer "softener".

Volatile Constituents:

The volatile constituents form what is known as a balanced solvent mixture, the purpose of which is to be used as a solvent or thinner for the non-volatile constituents. The components of this mixture must be in such a proportion to each other so as to insure a uniform evaporation rate when the lacquer film dries, and also to make sure that no precipitation of the "cotton" will occur at the time of thinning.

The number one, or the alcohol, component is generally composed of ethyl alcohol - 95% - and butyl alcohol. The ester component is made up in general of ethyl acetate and butyl acetate, while the hydrocarbon component usually consists of some compound such as toluol or, for special lacquers such as cable dopes, benzol.

Finished Lacquer:

The finished lacquer is prepared by taking a given weight of the non-volatile constituents and dissolving them in a given weight of the volatile constituents.

COMPETITION:

The question of competition will have to be viewed from two angles; first with regard to the Aroclors as resins, and second with regard to them as softeners. Since the Aroclors have more the properties of softeners than of resins, the softeners are more nearly competitive with the Aroclors than are the resins.

STLCOPCB4072150

Competing Resins - Synthetic

Name	Number	Manufacturer
Amberol	801	The Resinous Products & Chemical Co., Philadelphia, Pa.
Bakelite	XR-302	Bakelite Corporation, New York
Beckacite	(1110) (1114)	Beck, Koller & Company, Inc., Detroit, Michigan
Glyptal	1202	General Electric Co., Schenectady, N.Y.
Lewisol	(2) (3)	John D. Lewis, Inc., Providence, R. I.
Paraplex*	(5-B) (RG-2)	The Resinous Products & Chemical Co., Philadelphia, Pa.
Rezyl	(12) (19)	American Cyanamid & Chemical Corp., New York.
Resyl Balsams	-	American Cyanamid & Chemical Corp., New York.
Teglacs	-	American Cyanamid & Chemical Corp., New York.

* Paraplex can probably be considered a softener as well as a resin.

Competing Resins - Semi-Synthetic

Name	Number	Manufacturer
Ester Gum	None (one of the most generally used resins)	There are many manufacturers.

Natural Resins

Gum Dammar	(Batavia) (Singapore)	Imported - obtained through brokers.

Competing Plasticizers or Softeners

Name	Grades	Trade Name	Manufacturer
Dibutyl Phthalate*	-	-	Van Schaack Bros., Chemical Wks., Inc., Chicago, Illinois.
			Monsanto Chemical Company, St. Louis, Mo.
Tricresyl Phosphate*	-	Kronitex	Kavalco Products, Inc., Nitro, W. Va.
		Lindol	Celluloid Corp., Newark, N.J.
		-	Monsanto Chem. Co., St. Louis, Mo.
Abalyn	(A rosin products recommended for lacquer formulation.)		Hercules Powder Co., Wilmington, Del.

DSW 312165

1-1-35

AROCLOR IN LACQUERS

Name	Grades	Trade Name	Manufacturer
ADM-100	(A modified linseed oil for lacquer formulation)		Archer-Daniels Midland Co., Milwaukee, Wisc.
Castor Oil (Baker's)*	Number 4 - Blown Number 15 - Blown Number 16 - Blown AA - Unblown		The Baker Castor Oil Co., Jersey City, N. J.
Spencer-Kellogg Oil	(A modified castor oil for lacquer formulation)		Spencer-Kellogg & Sons, Inc., Buffalo, N. Y.

* There are other manufacturers of these products - this list is by no means complete.

In listing these products, only those that are in more or less general use have been included. There are some notable exceptions, however, in the cases of such materials as Abalyn, ADM-100 Oil, and Spencer-Kellogg Oil.

The materials listed in these tables must not be thought of entirely as competing products, because they may be more important as aids or auxiliaries in co-development work with the Aroclors. In fact, it is believed preferable to regard them more in this light than as competitors.

ADVANTAGES:

In thinking of any advantages the Aroclors may have, the statements made in the final paragraph under Competition must be borne in mind. It is preferable to confine oneself to a discussion of the outstanding properties of the Aroclors, for it is believed that it is only through the development of some specific property that progress is going to be made.

The properties of the Aroclors that should be emphasized are:

1) Low vaporization loss.
2) Pale color.
3) Adhesion.
4) Chemical Stability
   (a) to light;
   (b) to water, acids and alkalies;
   (c) to heat;
   (d) to oxidation;
   (e) to chemical action in general.
5) Non-flammability.
6) Non-corrosiveness.
7) Solubility in commonly used lacquer solvents.
8) Thermoplastic properties.

DSW 312166

A resume' of the properties that Aroclors impart to lacquers and the types of lacquers for which they are recommended may be given briefly as follows:

In a dammar-type lacquer the plasticiser-softener combination, such as the usual dibutyl phthalate-castor oil combination, may be advantageously replaced by an Aroclor alone. The resulting lacquer is less subject to checking and cracking on outside exposure and retains its gloss.

STLCOPCB4072152

AROCLORS IN LACQUERS

Aroclor 1262 may also be substituted entirely for the resin in certain types of lacquer. The clear lacquer, so produced, is practically colorless and provides an excellent base for white enamels. Such enamels, however, do not withstand weathering as well as those containing dammar in addition to the Aroclor.

The advantageous properties of the Aroclors in imparting added weather resistance to properly formulated lacquers may be traced to their resistance to the action of sunlight, to their permanency in the film, and to their extreme chemical stability. The Aroclors do not oxidize, "dry" or harden. The Aroclors are unaffected by dilute acids and even by hot caustic solutions. They are not subject to polymerization, rancidity or other change, as far as is known.

When added to a nitrocellulose solution, the Aroclors reduce the viscosity slightly. This change in viscosity takes place at once and no further change due to the presence of the Aroclor occurs on several months aging in closed containers.

By virtue of their high refractive index, they impart apparent depth to the lacquer film. Aroclor 1262 has adhesive properties and the lacquers containing it have good adhesion. Lacquers containing the Aroclors dry normally and give a hard, non-tacky, durable film of excellent gloss.

Certain lacquer technologists have found that a lacquer containing Aroclor can be polished with a minimum of rubbing and, furthermore, that the Aroclor seems to impart a harder finish to a lacquer film than oils, tricresyl phosphate, or dibutyl phthalate. It has also been reported that properly formulated lacquers containing Aroclor show no tendency to "spew" or "sweat out" when buffed.

In addition to the properties of general interest, other properties of the Aroclors are of value in formulating lacquers to fit special requirements. Aroclors 1254 and 1262 do not support combustion, and when present in nitrocellulose films they retard the rate of burning. The Aroclors retard the rate of transfer of moisture and of gases through a nitrocellulose film, and by virtue of this fact have already found extensive use in protective lacquers for application over those types of electrical insulating materials, such as rubber, that deteriorate rapidly in contact with oxygen, ozone, moisture or other vapors or gases.

PROCEDURE:

Upon visiting a lacquer company, every effort should be made to see the chemist in charge of formulation or production. In large companies the director of research should always be seen. As a general rule a great deal will not be accomplished until these respective individuals are seen.

A complete discussion of the properties of the Aroclors should be given, emphasis being placed upon the possible formulation of a new lacquer with some one of these properties as the background.

STLCOPCB4072153

1-1-35

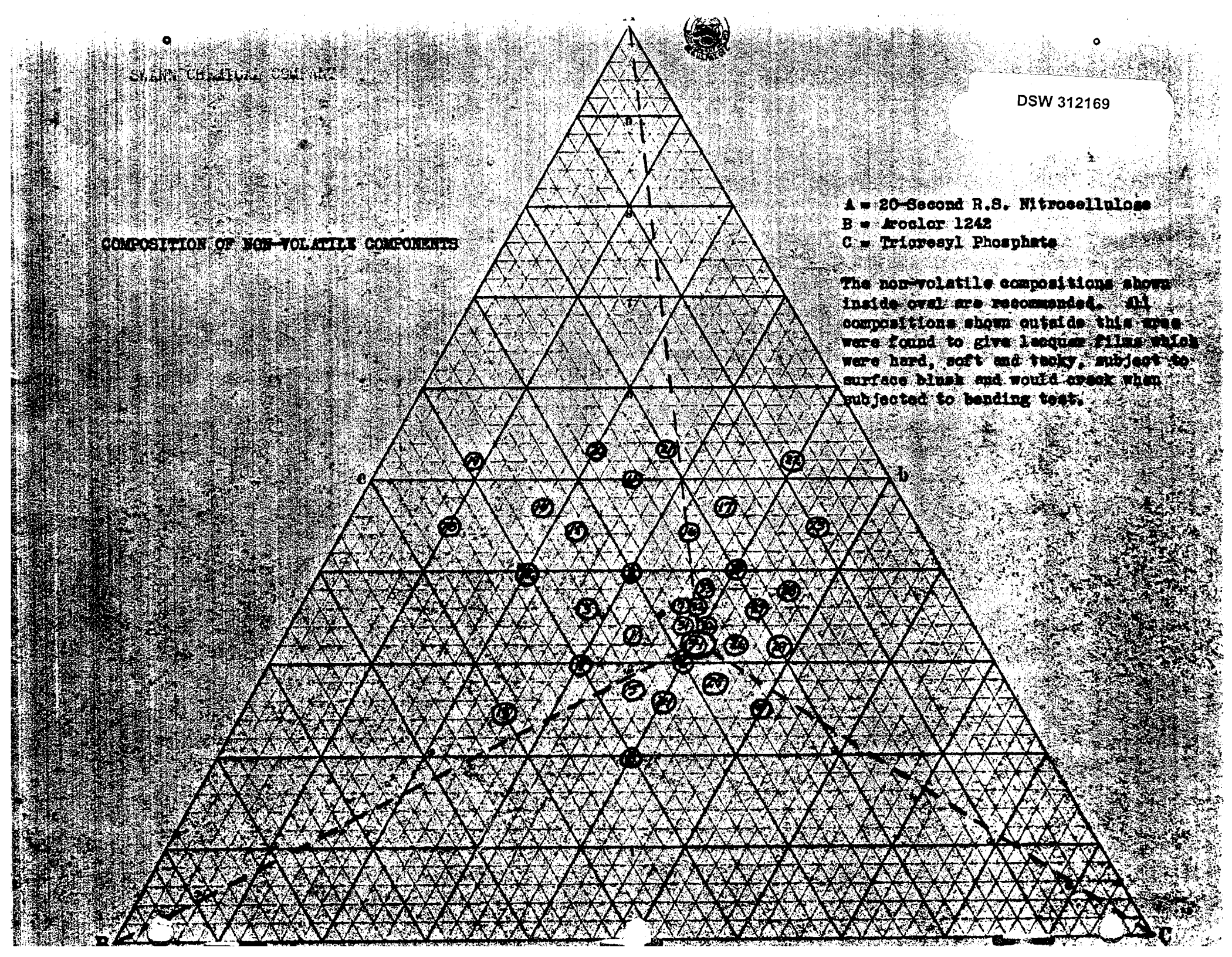
AROCLORS IN LACQUERS

When discussing the use of Aroclors in lacquers, the salesman should remember that the Aroclors are not solvents for nitrocellulose and that for this reason an excessive amount of Aroclor must never be used in the formulation of a lacquer. The limiting percentages that can be used for successful results have been carefully worked out by a large number of experiments. The few simple rules that must be followed in formulating lacquers with the Aroclors are embodied in a booklet entitled "The Properties of Two Aroclors of Special Interest to Manufacturers of Lacquers". Copies of this booklet may be had on application to our sales offices. It is recommended that the salesman offer copies of this booklet to interested lacquer manufacturers.

Attempts should be made to determine what particular lacquers a manufacturer specializes in, and what problems he is studying at the time of the call.

STLCOPCB4072154

DSW 312169



STLCOPCB4072155

STLCOPCB4072156

DSW 312170

S[illegible]ANN CHEMICAL COMPANY

Non-volatile component of lacquers (25%) shows effect of varying amounts of Nitrocellulose, Arochlor 1254 and Tricresyl Phosphate. All dissolved in 75% by weight of volatile component consisting of 16% Ethyl Acetate, 22% Ethyl Alcohol and 62% Benzol.

The non-volatile compositions shown inside oval are recommended. All compositions shown outside this area were found to give lacquer films which were hard, soft or tacky, subject to surface blush and would crack when subjected to bending test.

