AROCLOR

Aroclor is Monsanto's brand name for its capacitor impregnant composed of chlorinated biphenyl.

Aroclor is classed as a capacitor Askarel. The term "Askarel" is defined by the American Soceity for Testing and Materials (ASTM) as "a generic term for a group of non-flammable chlorinated hydrocarbons used as electrical insulating media".

Aroclor was first used in U.S.A. in 1929 and is now extensively used by the capacitor industry throughout the world. Monsanto has been producing Aroclor at its Newport plant since 1951.

Aroclor has been used in impregnated paper capacitors since its introduction into industry. In more recent years its use has been extended to capacitors in which polypropylene film forms part of dielectric.

Aroclor impregnated capacitors are used mainly to operate at power frequency. Some are used-with water cooling- at high frequencies and some - with suitable additives - in D.C. circuits.

AROCLOR 1342

In recent years most capacitor manufacturers switched their production to use mainly trichloro biphenyl sold under the Monsanto name of Aroclor 1242. The grade offered the best cost performance and was essential for capacitors operating in a cold environment.

More recently Aroclor 1242 has been replaced by Aroclor 1342. It is identical to Aroclor 1242 but has been modified to reduce the content of highly chlorinated components. The reason for this change is that environmental studies suggest that the more highly chlorinated components, especially those containing five and six chlorine atoms per modecule, are more persistent and therefore more likely to accumulate in the environment. Aroclor 1342 complies with the CIGRE recommendations that capacitor askarels should not contain more than 3.5% of pentachlorobiphenyl and more highly chlorinated biphenyls.

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Advantages of Aroclor

1. Capacitors having the least volume and mass per unit of reactive power can be built.
2. Raw materials costs can be reduced because of this higher efficiency.
3. Labour costs can be reduced because smaller windings are required and plant throughput is increased.
4. Overload security is provided by uniform permittivity of impregnant and paper.
5. Long lasting capacitors result from high stability and resistance to oxidation.
6. Reduced fire hazard.

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SPECIFIED PROPERTIES OF AROCLOR

Although Aroclor 1242 is no longer available its properties are shown alongside those of Aroclor 1342 for comparison.

Property	Aroclor 1142	Aroclor 1242
Appearance	Clear-free from suspended matter and sediment	Clear-free from suspended matter and sediment
Colour (APHA) max	50	50
Density (Kg/m^3) at 20°C	1370 - 1385	1380 - 1390
Refractive Index at 20°C	1.6235-1.6255	1.6250-1.6270
Kinematic viscosity (cst) at 20°C	ca 55	55 - 71
Flash Point (°C) min.	170	170
Fire Point	none to boiling point	none to boiling point
Pour Point (°C) max.	-18	-18
Neutralisation Number (mg KOH/g) max.	0.01	0.01
Inorganic Chlorides (ppm) max.	0.05	0.05
Hydrolysable Chlorides (ppm) max.	1.0	1.0
Volume resistivity at 100°C		
500V. after 1 minute ($T\Omega$ cm) min.	2^{X}	2^{X}
Dissipation factor at 100°C (50hz) max.	0.02^{X}	0.02^{X}
Relative permittivity at 100°C (50hzs)	4.80 - 5.00	4.70 - 4.90

These values apply to bulk deliveries. For deliveries over long distances in drums, the dissipation factor may be increased to 0.04 and the resisitivity decreased to 1 $T\Omega$ cm.

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NON-SPECIFIED PROPERTIES OF AROCLOR.

(Typical values are given for information only and again Aroclor 1242 values are given alongside Aroclor 1342 for comparison).

Property	Unit	Aroclor 1342	Aroclor 1242

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Storage, Handling and Disposal of Aroclor

Caution

Aroclor contains POLYCHLORINATED BIPHENYLS (PCB's) which some studies have shown may be persistent, an environmental contaminant and, possibly, injurious to certain forms of bird, aquatic and animal life.

Drums

Inside storage is recommended to prevent contamination of the product by water. If the drums have to be stored outside they should be stacked on their sides to prevent water accumulating around the bungs and being breathed into the drum during severe ambient temperature changes.

Drum storage areas should be organised so that any leakages are collected for safe disposal.

Partially emptied drums should not be left open to the air.

Bulk

The supply of Aroclor in bulk tank car loads, offers many advantages to medium and large volume users, compared with drum deliveries. Unloading, storing and transferring to the production unit is safer, easier, faster and cheaper. Material losses due to spillage and incomplete emptying of drums are eliminated. The possibility of product contamination during handling is greatly reduced.

Even where storage and handling facilities are not at present available, the economics of bulk handling may quickly pay for the tanks and piping systems required.

A booklet indicating the type of system necessary for the efficient handling of Aroclor in bulk is available from Monsanto.

As soon as a changeover to bulk delivery is contemplated, experienced Monsanto personnel will be available for site discussions regarding the most efficient type of installation for the particular location and an offloading procedure appropriate to that particular installation.

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Handling Precautions

Aroclor drums and containers carry the following label which gives general instructions for handling:

IMPORTANT CHLORODIPHENYLS (42%-54%) (or 60%) (PCB)

- This product contains POLYCHLORINATED BIPHENYLS (PCB's) which some studies have shown may be persistent, an environmental contaminant and, possibly, injurious to certain forms of bird, aquatic and animal life.

PREVENT ANY ENTRY INTO THE ENVIRONMENT THROUGH SPILLS, LEAKAGE, DISPOSAL, VAPOURISATION, RE-USE OF CONTAINERS OR OTHERWISE.

SPILLS, LEAKAGES AND WASTE PRODUCT MUST BE COLLECTED.

Use of this product must be restricted to applications which can be controlled so that entry into the environment does not occur and to applications in which it cannot come into contact with food, animal feedstuffs or pharmaceuticals.

HARMFUL SUBSTANCE IF TAKEN INTERNALLY OR IF IN PROLONGED CONTACT WITH THE SKIN.

CAUSES IRRITATION OF SKIN AND EYES.

DURING SHIPMENT AVOID SPILLS AND LEAKAGE INTO INLAND WATERWAYS AND THE SEA.

Store away from food, animal feedstuffs and pharmaceuticals.
Keep container tightly closed.
Do not eat or smoke when using.
Avoid breathing vapours, mist or fumes.
Do not wear contaminated clothing.
Wash product from skin with soap and water.
Wash eyes by flushing with water.

In addition to the foregoing we can add that:

1. Animal toxicity tests (small mammals) indicate that acute oral toxicity is low but that acute dermal toxicity may be moderate.
2. When handling the fluid minimise contact with the skin and wash any off with soap and water. People with sensitive skins should wear gloves resistant to chlorinated solvents or apply a silicone hand cream.
3. Should Aroclor accidentally splash or be rubbed into the eyes, they should be rinsed thoroughly with water for a few minutes. It is suggested that all operators be provided with safety glasses as Aroclor will cause pain if it gets into the eyes.
4. Elementary rules of hygiene should be applied such as not smoking, eating or drinking during handling and contaminated clothing should be discarded.
5. Aroclor should be handled at ambient temperatures in well ventilated areas. If hot Aroclor has to be handled, a respirator with an active carbon canister should be worn.

Disposal of empty drums and waste Aroclor

Handling Aroclor in bulk will minimise the problems associated with handling of drums. Waste Aroclor should be disposed of by special high temperature incineration at 1000°C minimum with a residence time of 1.5 seconds or longer or alternatively by a method conforming to local regulations. Empty drums should not be reused for anything except scrap Aroclor. If this is not possible each drum should be ringed twice with kerosene and the washings incinerated as above. Drums should then be crushed and buried on an approved toxic dump in accordance with local regulations.

Care must be exercised during such disposals and the ultimate use of Aroclor to avoid pollution particularly of sewers and waterways.

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