

**TECHNICAL REGULATIONS
FOR PCBS (POLYCHLORINATED BYPHENILS) MANAGEMENT**

1	GENERAL PROVISIONS	3
2	SCOPE.....	5
3	PCB-CONTAINING EQUIPMENT	6
	3. 1. Applications	6
	3. 2. PCB-containing transformers and capacitors used in Ukraine:	6
4	REQUIRMENTS FOR PCB-CONTANING EQUIPMENT	8
	4. 1. General requirements for operational PCB-containing equipment.....	8
	4. 2. Monitoring. Elimination of damages and leakages.....	10
5	IDENTIFICATION, INVENTORY, LABELING AND REGISTER OF PCB-CONTAINING EQUIPMENT	13
	5. 1. Identification, inventory and register	13
	5. 2. Identification and labeling	14
6	MANAGEMENT OF PCB-CONTAINING EQUIPMENT, MATETIALS AND WASTE.....	18
	6. 1. Storage	18
	6. 2. Transportation	20
	6. 3. Handling.....	22
	6. 4. Decontamination	22
7	STAFF TRAINING.....	27
8	DATA REQUIRMENTS.....	28
	ANNEX 1.....	29
	ANNEX 2.....	31
	ANNEX 3.....	44

1 GENERAL PROVISIONS

1. Technical Regulations for PCBs management were prepared and developed based:

- EU Council Directive 96/59/EC on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCB/PCT);
- Stockholm Convention on Persistent Organic Pollutants [Ukraine ratified the Stockholm Convention by issuing a relevant Law №949-16 "Ratification of the Stockholm Convention on Persistent Organic Pollutants", on 18.04.2007, Verkhovna Rada of Ukraine, 2007, № 30, art.396];
- Commission Decision 2001/68 / EC of January 16, 2001 establishing two reference methods of measurement of PCBs;
- Regulation (EC) № 1272/2008 of the European Parliament and the European Council of 16 December 2008 on classification, labeling and packing of substances and mixtures;
- Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives;
- Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control);
- Law of Ukraine on ratification of the Stockholm Convention on Persistent Organic Pollutants (Bulletin of the Verkhovna Rada 2007, № 30, art. 396);
- Decree of the Cabinet of the Ministers of Ukraine of 25 July 2012 № 589-p on implementation of the Stockholm Convention on Persistent Organic Pollutants.

2. Definitions of key terms used in Technical Regulations:

PCBs are synthetic aromatic compounds formed in such a manner that the hydrogen atoms on the biphenyl molecule (two benzene rings bonded together by a single carbon-carbon bond) may be replaced by up to 10 chlorine atoms. The general molecular formula for PCBs is $C_{12}H_{10-n}Cl_n$, where $n=1-10$ (CAS No. 1336-36-3). There are 209 congeners, although only about 130 congeners have actually been found in commercial chemical formulations. Typically, four to six of the 10 possible substitution sites are occupied by a chlorine atom. In case of dielectric fluids, PCB mixtures mainly containing either tri-, tetra-, or pentachlorinated homologues are used.

PCB-containing equipment is any equipment that currently contains or used to contain PCBs (e.g. transformers, capacitors, which contain the final products) that have not been decontaminated. Equipment that might contain PCBs should be treated as PCB-containing equipment until the contrary is proved;

Concentrated PCBs are synthetic PCB mixtures, marketed under certain brand names (sovol, sovtol etc.)

PCB-contaminated refers to materials, liquids and waste with PCB concentrations greater than of 50 ppm;

Sovol is a trade name of chlorinated biphenyls consisting of a mixture of isomers and homologues of the chlorinated biphenyl that correspond to pentachlorobiphenyls by the chlorination level.

Sovtol is a trade name of the mixture consisting of either 64% pentachlorobiphenyl (sovol) and 36% trichlorobenzene (Sovtol-2) or 75% sovol and 25% trichlorobenzene (sovtol-1);

Definitions of the following terms are used in these Regulations according to the Law of Ukraine on waste: "**waste**", "**hazardous waste**", "**waste manufacturer**", "**waste owner**", "**waste management**", "**waste processing (treatment)**", "**waste recycling**", "**waste disposal**", "**waste decontamination**", "**waste management activities**".

Other terms are used according to the Ukrainian legislation.

2 SCOPE

1. The present Technical Regulations provide guidance on management of PCB-containing equipment (e.g. transformers, capacitors) that contain PCB residues), equipment that hasn't been decontaminated, other materials and products containing polychlorinated biphenyls, PCB wastes and processes and methods related to PCB-management, including regulations and relevant guidelines.

2. The present Technical Regulations address identification, labeling, registration and monitoring of PCB-containing equipment, materials; emergency response measures for equipment damages and leakages; safety requirements for handling PCB-containing equipment and waste and requirements for disposal of PCBs and PCB-containing equipment, materials and waste.

3. The present Technical regulations are applicable to legal entities (regardless of ownership form) and individual entrepreneurs whose businesses run or use PCB-containing equipment, those involved in transportation, storage, decontamination and disposal of materials and products consisting of or containing polychlorinated biphenyls, disposal of PCB-containing equipment that lost its efficiency, PCB-containing waste management and other activities related to the use of PCBs in Ukraine.

4. The present Technical Regulations establish rights and responsibilities of legal entities (regardless of ownership form) and individual entrepreneurs whose businesses operate or use PCB-containing equipment, those involved in transportation, storage, decontamination and disposal of materials and products consisting of or containing polychlorinated biphenyls, disposal of PCB-containing equipment that lost its efficiency, PCB-containing waste management and other activities related to the use of PCBs in Ukraine

3 PCB-CONTAINING EQUIPMENT

3. 1. Applications

Closed systems:

- insulating fluids and / or coolants in transformers (GOST 16555);
- liquid dielectric in capacitors (GOST 1282, GOST 18689);
- switches and other electric equipment.

Partially open systems:

- heat transfer fluids;
- hydraulic fluid in lifting equipment, trucks and pumps;
- high pressure pumps;
- vacuum pumps;
- voltage regulators;
- liquid filled electric cables;
- liquid filled circuit breakers.

Open systems:

- paints
- lubricating fluid in oils and lubricants;
- water-repellent fluids for filtering and flame retardants for wood, paper, fabric and leather;
- laminating in the pulp and paper industry;
- additives to adhesives, sealants and corrosion-resistant coatings;
- main component for insecticides;
- polymerizer gasket for petroleum products;
- immersion oils for microscopes;
- pesticides preparation;
- cable sheaths.

3. 2. PCB-containing transformers and capacitors used in Ukraine:

PCB-containing transformers:

1. Three-phase step-down hermetic transformers of general usage;
2. Three-phase step-down transformers for supplying complete rectifying semi-conductor substations for workshop direct electric systems ;
3. Three-phase step-down transformers for supplying thyristor electric drive converters;

4. Three-phase step-down transformers with compensating reactor for supplying thyristor converters in electrolysis baths;
5. Transformers for use in complete transformer substations for supplying contact electric welding machines.

More detailed information on PCB-containing transformers is given in the Annex 1.

PCB-containing capacitors:

1. Cosine capacitors of model KC for power factor increase in electric plants with alternating current and 50 (60) Hz frequency;
2. Cosine capacitors of model KCK for power factor increase in electric plants with alternating current and 50 (60) Hz frequency;
3. Capacitors for electric thermal plants with frequency ranging from 0,5 kHz to 10,0 kHz;
4. Capacitors to be used in batteries of induction furnaces or other electric thermal plants with 50 Hz frequency;
5. Capacitors for power factor increase in ship electric plants with alternating current of 50 Hz frequency;
6. Capacitors for power factor increase in TDK-500 welding transformer;
7. Capacitors for assembling batteries with longitudinal compensation of reactive resistance in power transmission lines;
8. Capacitors for shunt batteries of direct power transmission lines;
9. Tuned capacitors for filter batteries of power transmission lines and power filters of higher harmonics operating in static capacitors and capacitor facilities;
10. Capacitors for circuits of one-phase induction motors;
11. Capacitors for circuits of auxiliary machines in electric locomotives with alternating current;
12. Capacitors for circuits of thyristor drives in the rolling-stock of electric transport;
13. Capacitors for semiconductor frequency converters;
14. Impulse capacitors.

More detailed information on PCB-containing capacitors is given in the Annex 2.

4 REQUIRMENTS FOR PCB-CONTANING EQUIPMENT

4. 1. General requirements for operational PCB-containing equipment

Operational electrical equipment has to be properly functioning and be tested according to the current legislation.

Inventory of all electrical equipment is a top priority aimed at identification and labeling of PCB-containing equipment, registration of its amount and location. Equipment should be properly labeled with easy readable nameplates and bright caution signs and be duly protected. PCB-containing equipment requires careful and highly professional handling.

If PCBs are identified in operational equipment (PCBs containing more than 5 ppm), the following measures are to be taken:

- label equipment and facilities with such equipment with clear and bright caution signs;
- make sure that equipment has no leakages and no signs of corrosion;
- place equipment in isolated rooms. This will allow contaminated waste to be shut off in a special area. It is recommended to place equipment in airtight and resistant to mechanical damage containers. Chemical cleaning, polishing or treatment of soil is not recommended while handling leakages because it can increase the amount of waste contaminated with PCBs.

PCB-containing transformers can be operated only if their liquid complies with standards and specifications on dielectric quality and provided that transformers are properly functioning and have no leakages.

Only undamaged hermetically-sealed PCB-containing equipment is allowed for operation. Guidelines and requirements on operating electrical equipment in Ukraine established by the current legislation are listed in Annex 3 of the present document.

Operational PCB-containing equipment is subject to routine maintenance according to the manufacturer's instructions on handling, treatment and prevention of PCB releases into the environment.

Maintenance of PCB-containing equipment should also include regular inspections and testing with a view to identify any defects related to transformers operation and take relevant measures to correct them.

The simplest and the most economical way to check operational and stored transformers is visual inspection. It can also be supplemented by electrical and chemical testing (e.g. content of dielectric fluid).

Safety checks of PCB-containing equipment should cover all company's equipment and be recorded to ensure their regularity.

Emergency response measures must be incorporated in standards, technical specifications and operation documents on equipment of certain types and models (brands). Safety requirements for equipment are developed in accordance with GOST 12.2.003-91 and equipment application, performance and operating conditions.

Transformers with PCB concentration above 0,05% by weight must be decontaminated to the level less than 0.05% but above 0.005%, if possible. Equipment labels should be changed with new ones.

Entities that own or hold PCB-containing equipment should:

1) appoint officers responsible for handling of PCB-containing equipment, materials and waste;

2) ensure compliance with health and safety regulations for handling PCB-containing equipment. In particular:

- i. provide staff with special protective clothing and gears for handling PCB-containing equipment;
- ii. not allow workers who weren't trained to handle PCB-containing equipment, materials and waste and didn't receive the relevant instructions ;

3) identify and label PCB-containing equipment, materials and waste;

4) keep record of PCB-containing equipment, materials and waste;

5) provide temporary storage for PCB-containing equipment, materials and waste;

6) keep record of documentation according to the relevant regulatory and methodological documents for registering PCB-containing equipment, materials and waste, as well as monitoring their state;

7) ensure compliance with legal, occupational and environmental safety regulations on PCBs;

8) immediately inform the competent authorities (local environmental authorities and regional agencies of the State Emergency Service of Ukraine) in case of PCB leakages;

9) carry out operations to eliminate PCB releases into the environment in case of PCB leakages;

10) no measures should be taken on:

- reducing PCBs concentration or PCBs recycling;
- unauthorized disposal of PCB-containing equipment and waste at household and industrial waste landfills;
- mixing PCB-containing wastes with other wastes to reduce PCBs concentration;

11) transport PCB-containing equipment and waste according to the legislation on hazardous waste transportation;

12) minimize risks of PCB impact and exposure and ensure the following:

1) PCBs are stored in airtight and hermetically sealed equipment where the risk of releases into the environment can be minimized and consequences quickly eliminated;

2) equipment is not operated in areas for production and processing of foods and animal feed;

3) all necessary measures to avoid electrical problems and prevent fires are taken when used in populated areas, schools and hospitals. Regular hermetical seal testing should be done.

4. 2. Monitoring. Elimination of damages and leakages

Technical operating conditions of PCB-containing equipment must adhere to the Guidelines on inspections, examination (technical diagnostics) and testing of high-risk vehicles, machinery and equipment, approved by the Cabinet of Ministers of Ukraine of May 26, 2004 № 687.

Technical and/or expert equipment inspections are performed by certified experts of specialized and authorized organizations who are not involved in designing, manufacturing, supplying, purchasing, holding, operating, installing, adjusting, maintaining, repairing, upgrading, reconstructing or replacing this or similar equipment.

Technical inspections are carried out in several stages: examination of operation, project and maintenance documents (if any); assessment of operating conditions; testing and trial run if required by health and safety regulations, methodological and operation documents; technical evaluation; establishment of future operating terms and conditions.

Based on the results of expert inspection, relevant organizations, may establish that the PCB-containing equipment must:

- continue its operation according to operation documents;
- continue its operation with limited use of some equipment parameters (also for a certain period);
- be subject to maintenance;
- be subject to modernization and reconstruction;
- be used for different purposes;
- be decommissioned.

Expert appraisal must be based on:

- a statement explaining objective and grounds of the expert examination;
- general information about equipment;
- information about the organization and experts responsible for examination;
- operation and technical documentation;
- nameplate information (equipment specifications);

- inspection schedule;
- information on compliance of operating conditions with equipment nameplates;
- findings of expert examination;
- conclusions indicating residual or extended period of operation;
- recommendations on operational conditions.

Entities holding PCB-containing equipment continuously monitor their condition. Condition monitoring of reserve and decommissioned PCB-containing equipment is conducted for timely identification of PCB leakages and taking preventive measures to stop hazardous substances from spreading.

During PCB-containing inspections, the following signs should be thoroughly examined:

- oil stains near the equipment;
- oil stains or smudges on the equipment (welding seams, gaskets, valves, etc.); external damages;
- oil pan (tray) sealing.

Electrical PCB-containing equipment must be subject to regular inspections. These checks include assessment of technological and production parameters (e. g. technical characteristics, permittivity, leakages). Inspections cover:

- all sealed elements of equipment (visual inspection of leakages);
- components that protect oils from oxidation (corrosion) (visual inspection, since equipment holding insulating oils is painted regularly due to the continuous heat diffusion);
- damages of equipment (hermetically sealed capacitors tend to “deflate”).

The frequency of inspections depends on types of equipment and its conditions :

- frequency of inspections of operational (reserve) equipment is established in technical regulations for equipment;
- frequency of inspections of decommissioned equipment should be conducted at least once every 3 months.

If damaged equipment or leakages are detected, a Chief Technician and a responsible officer for handling PCB-containing equipment and waste (Technical Director, Chief Engineer, etc.) must be immediately informed to be able to take emergency measures and prevent further PCB leakages and releases into the environment as soon as possible.

After draining, PCB-containing transformers are transported to the temporary storage sites for PCB decontamination (cleansing).

PCB-containing equipment must be drained within special sites covered with impenetrable coating and absorbing materials. Such sites should also be provided with a device for localization and cleanup of PCB spillages.

Any PCB spillages found on concrete slabs or similar surfaces should be immediately removed with the help of absorbents (dust, peat, rags etc.). PCB-containing waste resulting from such operation should be packed and stored.

If PCB spillages (leakages) take place on the soil, the contaminated soil should be isolated and packed in a special container. Heavily contaminated sites are identified by scorched vegetation and "oily" soil. Contaminated soil should be isolated from the area through visual examination of stains and a 10 cm perimeter around them. The depth of excavation must meet the penetration depth of PCBs, but not less than 20 cm.

If damages were established, it is necessary to tighten the bolts. If it didn't stop the leak, the part of insulating oil should be drained below the brim, sealing lid should be replaced

The oxidized surface must be deoxidized and polished with metal brush and sandpaper. The spot should be degreased with a solvent and checked for metal chips and leakages with the help of absorbent paper (filter paper or cloth). Even if there are no leakages, the spot should be treated with a solution to neutralize iron oxide ("Antirost" or any similar) and painted.

Even if a small leakage took place, the leaking component (e.g. radiator) should be dismantled and sealed, possibly substituted. Transformers are subject to maintenance.

Damaged PCB-containing capacitors that cannot be repaired, must be decommissioned and dismantled, then transferred to temporary storage sites as waste.

5 IDENTIFICATION, INVENTORY, LABELING AND REGISTER OF PCB-CONTAINING EQUIPMENT

5. 1. Identification, inventory and register

PCB-containing equipment, items and wastes are identified during the inventory. Both operational and decommissioned oil-filled electrical equipment located on the entity premises or in temporary storage sites are subject to inventory.

PCB inventory is conducted in line with the Guidelines for inventory of polychlorinated biphenyls in Ukraine, approved by the Ministry of Ecology and Natural Resources of Ukraine ([under development](#)).

Inventory is carried out in two steps:

The first step includes identification of PCB-containing equipment during inspections based on the technical documentation, preparation of the preliminary register of PCB-containing equipment and mid-term reports;

The second step includes PCB analysis in laboratories, preparation of final reports and final register of PCB-containing equipment based on results of laboratory tests done by accredited laboratories.

The inventory is carried out by a commission appointed by the Head of the organization.

Staff that handles equipment is also engaged in inventories of PCBs and PCB-containing equipment. An inventory report is made based on the results of the inventory. The report must be approved by the Head of the organization. Inventory of operational (reserve) PCB-containing equipment and waste is conducted once a year.

All data on equipment, items and waste that were identified during the inventory have to be registered.

All owners holding PCB-containing equipment and waste must keep record of PCB-containing equipment and waste. PCB-containing waste and operational (reserve) and decommissioned (if still containing PCBs) oil-filled PCB-containing equipment are subject to registration.

Entities that operate PCB-containing equipment have to maintain a preliminary register of such equipment in accordance with Guidelines for PCBs inventory in Ukraine ([under developed](#)) by filling out preliminary record forms (templates).

Preliminary record forms should include information about the company and experts responsible for maintenance/repair, date and results of leakage examination. Record data should be accessible by competent agencies and the central executive body to ensure implementation of state policy on environmental monitoring (supervision). Decontaminated equipment is not subject to registration if there is a relevant document on its decommissioning. Preliminary record forms are filled out during the inventory.

PCB-containing waste should be recorded according to the "Procedures of state registration and certification of waste", approved by the Cabinet of Ministers of Ukraine №2034 of 11.01.1999.

The preliminary inventory of waste is conducted with the help of standard forms (including cards, questionnaires etc.). Preliminary register data must meet the requirements for completing statistical data and maintaining equipment .

Preliminary inventory is carried out by completion of the form № 1- BT "Record of waste, packaging materials and containers", approved by the Ministry of Environmental Protection of Ukraine of July 7, 2008 № 342.

Inventory is carried out based on Regulations on preliminary record of waste, packaging materials and containers based on the form № 1- BT "Record of waste, packaging materials and containers" filled out by enterprises, institutions and organizations of various forms of ownership and area of expertise and individual entrepreneurs whose companies produce waste, including PCB-containing packaging materials and containers.

Preliminary inventory of waste is done based on results of preliminary inventory and stands for extensive wastes description based on certain unified requirements (forms) that includes all necessary data on sound waste management in line with GOST 2195-99 on environmental protection, waste management, technical waste паспорт; amendments content, presentation and requirements.

Facilities that produce, process and recycle waste are recorded through the register of waste-producing facilities (WPF) and waste processing and recycling facilities (WPRF). Such registers include information about location, technical performance and environmental impact assessment of WPF and WPRF, quantitative and qualitative characteristics of produced, processed and recycled waste, and information regarding its management. Registers are organized in accordance with the Guidance on development of registers of facilities producing, processing and recycling waste, approved by the Ministry of the Ecology № 41 of 17.02.99, and registered in the Ministry of Justice of Ukraine on 18 March 1999, N 169/3462 on "Approval of a register form for facilities producing, processing and recycling waste".

Facilities that produce, process and recycle waste are recorded in the register, in line with the Resolution of the Cabinet of Ministers of Ukraine dated August 31, 1998 № 1360 on "Approval of maintenance of the register of facilities producing, processing and recycling waste.

State register of waste is based on the report form № 1-waste. Annual report on waste management is produced according to the State Statistics Service of Ukraine of 19.08.2014. № 243.

5. 2. Identification and labeling

PCB-containing items and equipment are identified based on both direct and indirect indicators. Direct indicators include equipment labels and technical documents containing information about PCBs and PCB analytical test results. Indirect indicators stand for similarity in equipment design,

manufacturer and date of its production with other PCB-containing equipment. Equipment that meets the above-mentioned criteria is considered PCB-containing.

Analytical tests of equipment fluid determine whether it contains PCBs or not. If there are reasons to believe that electrical equipment is filled with some other oils that can potentially be contaminated with PCBs, the absence of PCBs should also be determined by analytical tests.

Analytical testing is carried out in two stages. At the first stage, screening tests determine if chlorine compounds are present in oil. If they are, the second stage would be a chromatographic analysis that establishes whether identified chlorine compounds are actual PCBs and determines their concentration in oil. These analyses are done in accordance with the Guidelines for inventory of polychlorinated biphenyls in Ukraine (under development).

Labels should be easy to read, wear-resistant and be located in one of the following sites:

- near openings used for PCB filling or sampling;
- on a PCB-containing section of an item or equipment.

Based on inventory results, a special register is composed. It must include the following data:

- owner's name and address;
- equipment location and description;
- amount of PCBs in equipment;
- information about scheduled or performed treatment and transportation of PCB-containing equipment;
- declaration data.

Registration procedures are approved by the Cabinet of Ministers of Ukraine.

5.1.1 Equipment's labelling.

Based on visual examination, review of technical documents and PCB tests, the equipment, containing PCBs, and PCB waste, the proper labelling is made. The labelling should meet the international or national requirements. The color of the label should correspond to the potential danger of the equipment. The labels must be large enough and be located on such part of an equipment to be read easily. For example:

- near openings used for PCB filling or sampling;
- on a PCB-containing section of an item or equipment.

The Guideline of the Stockholm Convention on inventory of PCB³ recommends a labelling of the following format:

for the equipment with PCB concentration greater than 50 mg/kg (if that has been proved by analytical tests), the label shown in Figure 5.1 is recommended.

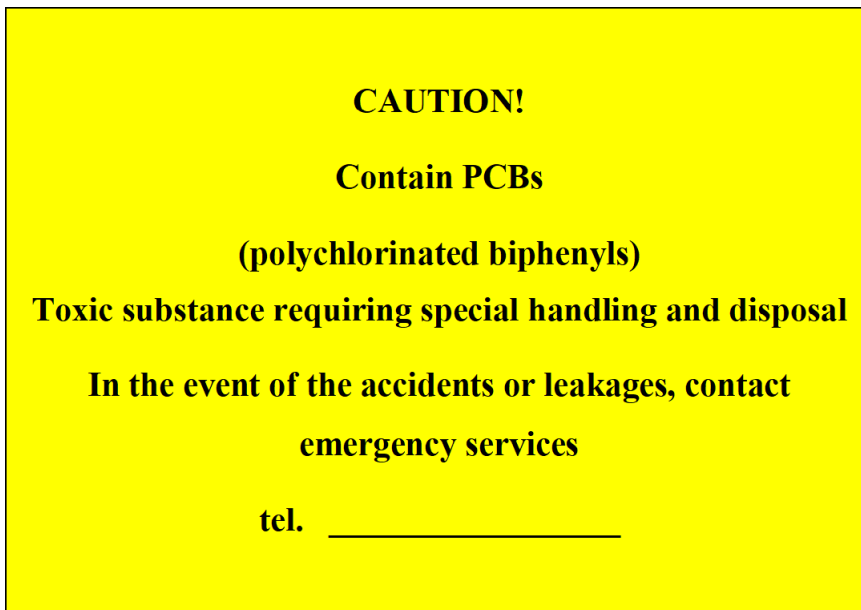


Figure 5.1. Labeling of equipment, in which PCBs are detected.

Such label attaches to equipment with PCB concentration greater than 50 mg/kg that was proved by analysis, or to equipment with PCB presence as determined in manufacturer's documents (for example, an information about coolant is marked).

for the equipment, in which PCBs are not detected, the label shown in Figure 5.2 is recommended.

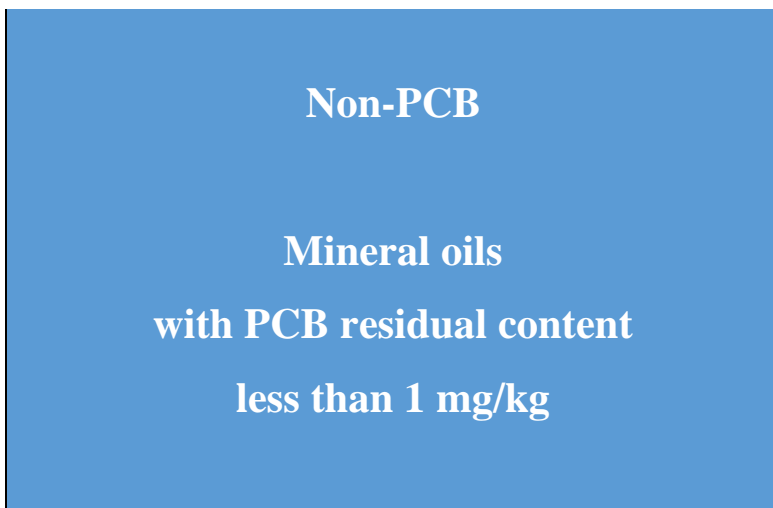


Figure 5.2. Labeling of equipment, in which PCBs are not detected.

for the equipment, which was cleaned to the acceptable PCB concentration (less than 50 mg/kg), the label shown in Figure 5.3 is recommended.

**DECONTAMINATED
PCB-CONTAINING EQUIPMENT**

PCB-containing liquid was substituted:
 with _____ (liquid name)
 on _____ (date)
 by _____ (organization)

PCB concentration in
 - previous liquid _____ % by weight
 - new liquid _____ % by weight

Figure 5.3. Labeling of equipment after re-filling of oil.

for the storages of PCBs, the label shown in Figure 5.4 is recommended.

CAUTION!
PCBs STORAGE

PCBs owner
 address _____
 tel. _____

Emergency service
 address _____
 tel. _____

Date of starting storage

Figure 5.4. Labeling of the storages of PCBs

6 MANAGEMENT OF PCB-CONTAINING EQUIPMENT, MATERIALS AND WASTE

6.1. Storage

PCB-containing decommissioned equipment and waste that can't be disposed of because of lack of available technology, must be stored at special sites.

PCB-containing equipment and waste should be stored in line with the legal framework regarding environmental protection, PCB releases into the environment must be prevented.

PCB-containing equipment and waste are stored on the premises of the entities who own (operate) PCB-containing equipment and wastes or in storage sites. The procedure of storage of PCB-containing equipment and waste is established by the Law of Ukraine "On Waste".

PCB-containing equipment and wastes are stored in specially designated sites taking into account equipment type, its quantity, as well as amount and types of PCB-containing wastes.

PCB-containing equipment and waste can be stored at:

- industrial and additional premises;
- permanent and temporary storage facilities (canopies);
- arranged outdoor sites.

Outdoor storage of unpacked PCB-containing capacitors, PCB -contaminated soil, rags and other solid wastes (except for contaminated buildings and structural components) is prohibited. PCB-contaminated buildings and structural components must be isolated from the contacts with the environment (e. g. covered with plastic wrap, canvas and other waterproof materials).

All storage facilities with PCB-contaminated equipment and waste must be located far from fire sources in areas that are not prone to flooding.

Storage facilities stores must be provided with natural or mechanical ventilation system to prevent PCBs to enter the air.

Storage sites (facilities) for PCB-containing equipment and waste must be accessible for monitoring. Storage facilities and outdoor sites should be protected with a fence to prevent access of unauthorized persons.

The floor of storage sites for PCB-containing equipment and waste should be waterproof and chemically resistant (concrete, ceramic tiles).

PCB-containing equipment and waste must be stored in separate compartments (areas) to prevent cross-contamination of equipment or mixing with other waste.

6.1.1. Storage of PCB-containing equipment

Storage of PCB-containing equipment at the temporary sites must meet the following requirements:

- undamaged PCB-containing equipment with no leakages may be stored without a package;
- damaged PCB-containing transformers may be stored without a package after sealing all the leaks;
- drained PCB-containing transformers can be stored without a package;
- damaged capacitors must be packed and stored in containers.

PCB-containing capacitors with corroded body or other damages should be packed in metal containers. If there are signs of leakage, capacitors must be placed in special plastic bags (e. g. oily stains on the capacitor body or around welds). Dielectric liquid should be drained in a container if capacitor was unsealed, connections broken or other significant damages occurred. After the draining, the capacitor should be packaged in a container. Some fluid-absorbent material (over 10 cm) should cover container's bottom (sawdust, peat, etc.) in case of PCB leakages.

Containers for storage of PCB-containing capacitors and solid waste should:

- be treated with anti-corrosion coating;
- be sealed to prevent leakages during transportation (container lid shouldn't be welded);
- have handles for lifting and transportation;

PCB-containing transformers and capacitors must be stored on metal trays or racks in the vertical position. Capacitors can't be stored one on top of the other one or in bulk.

All PCB-containing equipment must be labeled.

Containers should be stored on special stands to prevent their corrosion.

Storage sites must have curbs at least 15 cm high and run a unit for collection of liquid in case of spillages.

6. 1. 2. Storage of PCB-containing wastes

Liquid PCB-containing wastes are stored in containers (barrels, tanks).

Containers (barrels, tanks) for storing PCB liquids as well as PCB-containing solid and liquid wastes ensure environmentally safe storage, transportation and is for people's health. Storage of PCB-containing wastes must meet the following requirements:

- a container for storage of liquid PCB-containing waste must be sealed, made of steel and have double walls;
- solid PCB-containing waste (contaminated soil, sawdust, rags, etc.) must be placed in containers. PCB-contaminated soil and solid PCB-containing waste resulting from PCB spillages should be stored in separate containers.

6. 2. Transportation

PCB-containing equipment and waste are transported according to the legislation on waste, regulations for transportation of hazardous materials and environmental safety and health standards (State Standards of Ukraine ДСТУ 4462.3.01 and 4462.3.02).

PCB-containing equipment and wastes can be transported only if provided with a special license for its handling in line with legislation on hazardous materials transportation. Transportation of PCB-containing equipment and wastes must meet the following requirements:

- compliance with standards on hazardous materials transportation;
- vehicles transporting PCB-containing equipment and waste should be provided with a certificate for transportation of hazardous materials and comply with relevant guidelines on environmental and work safety;
- PCB-containing equipment and waste must be classified as hazardous according to the current legislation.

PCB-containing equipment and wastes are transported to storage sites for their further disposal in an environmentally sound manner and take measures to prevent PCB spillages and leakages as well as staff PCB exposure.

PCB-containing transformers and capacitors can be transported within the company premises by carts, cars, tractors, trucks and other vehicles that would disable mechanical damages from overturning, falling etc.

PCB-containing equipment can be transported only in the vertical position.

Damaged equipment must be transported with auxiliary equipment (trays, containers) and absorbing materials to prevent PCB spillages.

If a PCB spillage happened during the equipment transportation, the relevant emergency response measures must be immediately taken.

It is prohibited to transport damaged PCB-containing equipment together with other equipment, materials or waste.

PCB-containing equipment and wastes can be transported only by authorized staff.

Vehicles that transport PCB-containing equipment and wastes must have special signs that show their purpose. Each vehicle carrying PCB-containing equipment and wastes must have hazardous waste labels. The vehicles for transportation by road are equipped in accordance with the State Standard of Ukraine № 3689 and international agreements (for trans-boundary movements).

Labeling must include:

- caution sign, cargo name, hazard classification code according to the State Standard of Ukraine 4462.3.02 (indicated on the package);
- caution sign, hazard classification code and emergency card number if transported within the country according to the current legislation (for oversized load);

- a table containing caution sign, hazardous classification code, emergency code. In case of carriage by road, the cargo is labeled with "ADR"; in case of railway transportation - "RID". (indicated on the vehicle).

Signs of danger are indicated with hazard symbols that belong to a certain class according to the GOST 19433.

Labeling should be clear and easily recognizable (have contrasting colors).

Vehicles for waste transportation must have special signs that determine their purpose in accordance with the State standard of Ukraine № 3689.

PCB-containing equipment and waste can be transported only if a freight carrier holds a liability insurance that would cover any damages happened during transportation.

PCB-containing equipment and waste can be transported only if the following documents are available and valid:

- permit for carriage by road of hazardous goods issued in accordance with applicable law;
- waybill;
- invoice (if any);
- waste passport;
- cargo sheet;
- shipping list;
- certificate allowing hazardous materials transportation (if required by the legislation);
- a written statement from a sending party explaining that the cargo can be placed outdoors, its condition, packaging properties and wrapping comply with guidelines and other regulations;
- other references, if required;
- agreements including multilateral agreements, if required.

Please, note:

These delivery documents are required due to the current legislation.

Documents for transportation should include the following information:

- sender's name and address;
- recipient's name and address;
- cargo name, hazard class number, hazardous properties code, classification code;
- quantity and description of the cargo content;
- quantity of dangerous goods (volume, gross and (or) net weight) in their respective units;
- cargo name in the delivery document should start with: "The cargo contains" followed by the list of materials (substances), with italicized names, numbers, characteristics, classes and subclasses. Cross-border transportation of PCB-containing equipment and waste (export from Ukraine, import in Ukraine, transit through the country) must be performed in accordance with current legislation.

6. 3. Handling

PCB-containing equipment and waste must be provided with guidelines and technical regulations during handling. This documentation must undergo environmental and health expertise in accordance with applicable regulations.

PCB-containing equipment and waste must be handled with the help of technical and material resources established in license provisions.

All safety requirements of relevant guidelines on handling electrical equipment must be met during maintenance of operational PCB-containing equipment.

Strict preventive measures must be taken during elimination of damages and spillages of PCB-containing equipment, transportation and other operations related to damaged PCB-containing equipment and waste to prevent inhalation of volatilized PCBs and skin contact. Concentration of dangerous substances in the air at a height of 2 meters above the ground should not exceed 30% in accordance with GOST 12.1-005 and other relevant standards.

Damaged PCB-containing equipment, waste and PCB spillages must be handled with the help of protective equipment, following occupational safety legislation. To prevent inhalation volatilized PCBs, staff must use a respirator or a gas mask to protect oneself from chlorinated vapor.

Contaminated protective clothing and gloves must be packed in containers together with PCB-containing waste.

If external surface of equipment or containers is contaminated, it should be treated with a solvent (kerosene). Contaminated solvent and rags must be disposed as PCB-containing waste.

If staff's eyes were exposed to PCBs, they must be rinsed with water for 15 minutes. A person should be provided with further medical aid. In case a skin contact with PCBs, contaminated clothing should be immediately removed and skin rinsed with soap and water. Use of kerosene or other solvents is strictly prohibited.

A person who inhaled PCBs must be taken outdoors. His airways must be cleared (false teeth, vomit removed etc.).

If PCBs were swallowed, do not induce vomiting! If the person is conscious, give him water to drink in small portions at once. Self-medication is not recommended! Immediate medical help is needed! Use of oil-containing laxatives is recommended.

After all operations with PCB-containing equipment, one should wash his hands with water and soap.

6. 4. Decontamination

PCBs removed from equipment during its maintenance, repair, dismantling should be transferred to a temporary storage or be disposed of.

Polychlorinated biphenyls and PCB-containing products are disposed of in compliance with the Law of Ukraine "On Waste," "On occupational safety", "On ensuring sanitary and epidemiological

welfare of population", "On compulsory state social insurance against industrial accidents and occupational diseases leading to disability", "On fire safety", "On environmental protection", "On high-risk facilities".

Polychlorinated biphenyls and PCBs waste that are subject to disposal according to legislation on hazardous waste management.

Polychlorinated biphenyls and PCB-containing products are disposed of by entities included in the State Register of Ukraine's entities authorized to dispose polychlorinated biphenyls and PCB-containing materials. Equipment is disposed in an environmentally sound manner with technologies based on European standards regarding Best Available Techniques in line with Ukrainian legislation. Guidance on best available technology is presented in the "Guidelines on best available techniques "(BAT) for PCBs disposal (under development).

Operations on disposal and irreversible transformation of POPs contained in waste are provided in Annexes IVA and IVB of the Basel Convention. The following operations must be implemented to ensure that recycled waste and emissions don't contain any POPs:

- D9 Physico-chemical treatment;
- D10 Incineration on land;
- R1 Use as a fuel (other than direct incineration) or other means to generate energy;
- R3 Recycling / reclamation of organic substances which are not used as solvents, but only for processing waste into gas;

POPs released during waste pretreatment must be removed through D9 and D10 operations.

Incineration technologies for disposal of PCBs and PCB-containing waste must adhere to requirements for environmentally safe incineration defined in the Industrial Emissions Directive 2010/75 / EU of the European Parliament and the Council of November 24, 2010 (integrated pollution prevention and control).

Gases released from incineration plants are discharged through flue-gas stack with one or more chimneys, whose height should be calculated in such way to minimize the risks of PCB releases.

Incineration plants shall be operated in order to achieve a level of incineration such that the slag and bottom ashes Total Organic Carbon (TOC) content is less than 3 % or their loss on ignition is less than 5 % of the dry weight of the material.

Incineration plants shall be designed, equipped, built and operated in such a way that the gas resulting from the process is raised, after the last injection of combustion air, in a controlled and homogeneous fashion and even under the most unfavourable conditions, to a temperature of 850 °C, as measured near the inner wall for two seconds. If hazardous wastes with a content of more than 1 % of PCBs expressed as chlorine, are incinerated, the temperature has to be raised to 1100 °C. Each line of the incineration plant shall be equipped with at least one auxiliary burner. This burner must be

switched on automatically when the temperature of the combustion gases after the last injection of combustion air falls below 850 °C or 1100 °C.

Incineration and co-incineration plants shall have and operate an automatic system to prevent waste feed:

- at start-up, until the temperature of 850 °C or 1100 °C;
- whenever the temperature goes lower than 850 °C or 1100 °C respectively;
- whenever the continuous measurements show that any emission limit value is exceeded due to disturbances or failures of the purification devices.

The following parameters must be continuously measured:

- concentrations of the following substances: NO_x, CO, total dust, total organic compounds, HCl, HF, SO₂;
- temperature in the inner wall of the combustion chamber, pressure, temperature, humidity and oxygen content in flue gases.

At PCB-disposal stage, technical regulations should be developed in accordance with the Standard of Ukraine's organizations, Ministry of industrial policy of Ukraine (COY-H MIII) 03.100.50-088:2008 "Provisions on technical regulations for production at the chemistry entities (organizations)". Technical regulations must be approved by the regional agency of the State Labor Service of Ukraine.

Information on environmental impact of PCB-waste handling must be incorporated in the project documentation - volume (book, chapter) "Environment Impact Assessment (EIA)", developed in accordance with the state building standards (ДБН А.2.2.-1-2003) " Environment Impact Assessment (EIA)" during designing and construction of plants, buildings and structures and in the "Statement of environmental impact" according to the art. 4 of the state building standards А.2.2.-1-2003 (ДБН А.2.2.-1-2003).

These documents should be subject to the state environmental impact assessment according to the art. 15 of the Law of Ukraine "On environmental assessment (expertise)". Assessment should also include feasibility studies on introduction of technologies listed in the technological regulations, based on the criteria of performance, energy and resource intensity as well as compliance of the measures with air quality standards.

Technological documentation on disposal of PCBs and PCB-containing equipment should also be subject to assessment for projects on industrial construction and reconstruction in accordance with the provisions "On the procedure of the state assessment (audit) of project documentation for construction and reconstruction of production facilities and production of goods, approved by the

Cabinet of Ministers of Ukraine on 23.06.1994 № 431, carried out by expert technical centers of the State Labor Service of Ukraine, the State Sanitary and Epidemiological Service of the Ministry of Health of Ukraine, agency of the Fire Department of the Ministry of Internal Affairs of Ukraine.

PCBs are disposed of in line with technical requirements for production equipment, and 1.

GOST standard on Industrial processes and general safety requirements (Occupational Safety Standards 12.3.002-75), and CII 1042-73 "Sanitary rules for industrial processes management and hygienic requirements for equipment", approved by the Deputy Minister of Health and the Chief Sanitary Officer of the USSR on 04.04.1973.

Technological procedures should be developed based on output data on technological designing in accordance with the standard GOST 3273-95 "Production facilities safety. General terms and requirements".

Production facilities shall be equipped with ventilation system in accordance with the GOST standard 12.4.021-75 on occupational safety requirements. "Ventilation systems. General requirements" and "Building standards and rules 2.04.05-91 - Heating, ventilation and air conditioning."

All companies engaged in PCBs handling should develop an environmentally sound management (EOS) system to ensure proper management and monitoring of the environmental impact and human health.

Companies that dispose PCBs and PCB-containing equipment, and belong to high-risk facilities have to sign a liability insurance contract that would cover any potential damages caused by fires and accidents, including explosion according to the procedures and rules of mandatory liability insurance of business entities approved by the Cabinet of Ministers of Ukraine of 11.19.2002 № 1788.

An entity must obtain a permission to start (continue) dangerous operations with the help of vehicles, machinery, equipment etc. according to Decree "On approval of the procedure of permits issuance by the State Committee for labor protection and monitoring of its regional agencies" of the Cabinet of Ministers of Ukraine of 15.10.2003 № 1631.

The permit should enlist all measures required for a proper environmental protection and compliance of operational equipment with principles and responsibilities of the operating organization. The permit should also include emission ceilings for pollutants, similar parameters or technical measures and requirements for soil and groundwater protection and monitoring. Permit terms should be set based on BAT.

Entities that plan on performing operations related to PCB-containing waste must obtain a license for hazardous waste management.

In order to receive a license, such entities must demonstrate compliance with organizational and technical requirements.

An entity shall carry out timely certification of working places based on working conditions, where the manufacturing process, equipment, raw and other materials can potentially be dangerous and hazardous, affect employees' and their descendants health according to the requirements for workplaces certification approved by the Cabinet of Ministers of Ukraine of 08.01.1992 №442.

PCB-handling entities maintain a register of processed wastes.

An entity engaged in PCB waste management is responsible for taking all necessary measures to ensure that waste is properly packed and labeled in accordance with existing international and national standards during its collection, transportation and temporary storage.

Sites where toxic substances are released in the form of steam, gas or dust must be equipped with ventilation system.

Hazardous and toxic substances that were formed during waste management must be disposed (as much as possible) before being released into the atmosphere.

7 STAFF TRAINING

Management and officers of companies engaged in PCBs handling should receive proper trainings and gain proficiency in educational institutions of waste management agency.

Such trainings should include instructions for safe operating techniques, preventive measures, use of personal protective clothing and gears as well as occupational and fire safety during hazardous waste management.

Only trained staff (upon corresponding certification) is allowed to handle hazardous wastes.

PCB-holders are required to enable access to hazardous waste only to staff that undertook special trainings on handling hazardous substances according to the State Labor Service of Ukraine. Employees should work in compliance with rules and regulations on occupational and fire safety and industrial hygiene.

Staff should undertake relevant training, receive instructions and be tested on occupational safety matters during recruitment and work according to the requirements of the General Provision on trainings and tests on occupational safety, approved by the State Committee of Ukraine on occupational safety monitoring dated 26.01.2005 № 15, registered in the Ministry of Justice of Ukraine on 15.02.2005 № 231/10511 (with amendments) (HPAOP 0.00-4.12-05). Based on this document, PCB-holders must develop and approve a list of high-risk operations that require special training and annual testing on occupational safety.

Besides training, staff engaged in PCB management must be over 18 years old and undertake medical examination (including periodic checks) in accordance with Regulations on medical examination of certain staff categories, approved by the Ministry of Health of Ukraine on 21.05.2007 № 246 and registered in the Ministry of Justice of Ukraine on 23.07.2007 № 846/14113.

Staff involved in transportation of hazardous waste (dangerous goods) must hold a relevant ADR-certificate received based on training for drivers whose vehicle carries dangerous goods. Packaging and labeling of goods is carried out in accordance with the "Rules for Carriage of Dangerous Goods by Road", approved by the Ministry of Internal Affairs of Ukraine № 822 from 26.07.2004.

Employers must develop and approve a list of operations that require special recruitment procedure according to the List of operations requiring special hiring procedure approved by the Ministry of Health of Ukraine and the State Committee of Ukraine on occupational safety monitoring from 23.09.1994 №263/121, registered in the Ministry of Justice of Ukraine on 25.01.1995 №18/554.

8 DATA REQUIRMENTS

The State Register of entities engaged in handling of PCB-containing equipment and the State Register of entities handling decommissioned PCB-contaminated equipment and waste are maintained and updated by an authorized agency of the Cabinet of Ministers of Ukraine responsible for waste management. Such entities are included in the State Register based on guidelines established by competent authorities.

PCB- registers are electronic databases that collect, process, manage, store and protect data on entities that are engaged in PCB-management. Such databases are posted on the website by competent authorities of the Cabinet of the Ministers of Ukraine on waste management for public attention.

PCBs-containing transformers

1. Three-phase step-down hermetic transformers of general usage

Sovtol –10 - liquid dielectric used for transformer insulation and cooling.

Manufacturer – Chirchik transformer plant

№	Model of the transformer (№15-05 82)	Weight, kg	
		Total	Liquid dielectric
1	TH3-25/10	490	160
2	TH3-40/10	610	205
3	TH3-630/10	3400	1100
4	TH3-1000/10	5000	1800
5	TH3-1600/10	8000	2850
6	TH3-2500/10	12000	4120

№	Model of the transformer (№15-13-47 90 p.)	Weight, kg	
		Total	Liquid dielectric
1	TH3-25/10	490	160
2	TH3-40/10	610	205
3	TH3-630/10	3000	1100
4	TH3-1000/10	4000	1676
5	TH3-1600/10	7690	2765
6	TH3-2500/10	11180	2980

2. Three-phase step-down transformers for supplying complete rectifying semiconductor substations for workshop direct electric systems

Sovtol - liquid dielectric used for transformer insulation and cooling.

Manufacturer- Industrial Corporation "Uralektrovazhmash".

№	Model of the transformer	Weight, kg	
		Total	Liquid dielectric
1	THII-400/10	-	1500
2	THII-800/10	-	2750
3	THII-1600/10	-	3500
4	THIY-1000/10	-	2500
5	THIY-2000/10	-	3350

№	Model of the transformer	Weight, kg
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	(№15-05 67 p.)	Total	Liquid dielectric
1	THP-420/0,5II	1900	800
2	THP-750/10	4600	1700
3	THP-1800/10	6100	2500
4	THPY-1200/10	5600	2200
5	THPY-2000/10	8350	3350

2. Three-phase step-down transformers for supplying thyristor electric drive converters.

Sovtol-10 – liquid dielectric used for transformer insulation and cooling.

Manufacturer – Chirchik transformer plant.

№	Model of the transformer (№15-13-47 90 p.)	Weight, kg	
		Total	Liquid dielectric
1	TH3II-400/10	3250	1380
2	TH3II-630/10	4000	1350
3	TH3II-1000/10	5300	1970
4	TH3II-1600/10	8250	2850

4. Three-phase step-down transformers with compensating reactor for supplying thyristor converters in electrolysis baths

Sovtol - liquid dielectric used for transformer insulation and cooling.

Manufacturer – Chirchik transformer plant.

№	Model of the transformer (№15-05 82 p.)	Weight, kg	
		Total	Liquid dielectric
1	TH3IIY-1000/10	6000	2200
2	TH3IIY-2000/10	9000	3260

5. Transformers for use in complete transformer substations for supplying contact electric welding machines

Sovtol - liquid dielectric used for transformer insulation and cooling

Manufacturer – Chirchik transformer plant.

№	Model of the transformer	Weight, kg	
		Total	Liquid dielectric
1	TH3C-2500/10	11550	4160

PCBs-CONTAINING CAPACITORS

1. Cosine capacitors of model KC for power factor increase in electric plants with alternating current and 50 (60) Hz frequency

Weight of capacitors: zero size - under 18 kg, first size – under 30 kg, second size –under 60 kg.
Dielectric – trichlorodiphenyl impregnated capacitor paper.

Manufacturer of such capacitors – Ust-Kamenogorsk capacitor plan. The below Table demonstrates the data on capacitors of the II, III and IV series with 50 Hz frequency.

№	Model of the capacitor	Ratings			
		Voltage, kV	Power, Kilovar	Capacity, μF	Weight, kg
Series II					
1	KC1-0,22-6-3Y3 (1Y3, 2Y3)	0,22	6	395	27
2	KC1-0,38-18-3Y3 (1Y3, 2Y3)	0,38	18	397	27
3	KC1-0,50-18-3Y3 (1Y3, 2Y3)	0,50	18	229	28
4	KC1-0,66-20-3Y3 (1Y3, 2Y3)	0,66	20	146	28
5	KC1-0,22-6-3Y1 (1Y1, 2Y1)	0,22	6	395	27
6	KC1-0,38-14-3Y1 (1Y1, 2Y1)	0,38	14	309	27
7	KC1-0,50-14-3Y1 (1Y1, 2Y1)	0,50	14	178	28
8	KC1-0,66-16-3Y1 (1Y1, 2Y1)	0,66	16	117	28
9	KC2-0,22-12-3Y3 (1Y3, 2Y3)	0,22	12	790	54
10	KC2-0,38-36-3Y3 (1Y3, 2Y3)	0,38	36	794	54
11	KC2-0,50-36-3Y3 (1Y3, 2Y3)	0,50	36	458	55
12	KC2-0,66-40-3Y3 (1Y3, 2Y3)	0,66	40	292	55
13	KC2-0,22-12-3Y1 (1Y1, 2Y1)	0,22	12	790	54
14	KC2-0,38-28-3Y1 (1Y1, 2Y1)	0,38	28	618	54
15	KC2-0,50-28-3Y1 (1Y1, 2Y1)	0,50	28	356	55
16	KC2-0,66-32-3Y1 (1Y1, 2Y1)	0,66	32	234	55
Series II (t 45°C)					
17	KC1-0,22-6-3Y3 (1Y3, 2Y3)	0,22	6	395	27
18	KC1-0,38-16-3Y3 (1Y3, 2Y3)	0,38	16	353	27
19	KC1-0,50-16-3Y3 (1Y3, 2Y3)	0,50	16	204	28
20	KC1-0,66-18-3Y3 (1Y3, 2Y3)	0,66	18	132	28
21	KC2-0,22-12-3Y1 (1Y3, 2Y3)	0,22	12	790	54
22	KC2-0,38-32-3Y3 (1Y3, 2Y3)	0,38	32	706	54
23	KC2-0,50-32-3Y3 (1Y3, 2Y3)	0,50	32	408	55
24	KC2-0,66-36-3Y3 (1Y3, 2Y3)	0,66	36	264	55
Series II (t 50°C)					
25	KC1-0,22-6-3Y3 (1Y3, 2Y3)	0,22	6	395	27
26	KC1-0,38-14-3Y3 (1Y3, 2Y3)	0,38	14	309	27
27	KC1-0,50-14-3Y3 (1Y3, 2 Y3)	0,50	14	178	28
28	KC1-0,66-16-3Y3 (1Y3, 2Y3)	0,66	16	117	28

29	KC2-0,22-12-3Y3 (1Y3, 2Y3)	0,22	12	790	54
30	KC2-0,38-28-3Y3 (1Y3, 2Y3)	0,38	28	618	54
31	KC2-0,50-28-3Y3 (1Y3, 2Y3)	0,50	28	356	55
32	KC2-0,66-32-3Y3 (1Y3, 2Y3)	0,66	32	234	55
Series III					
33	KC1-0,22-8-3Y3 (1Y3, 2Y3)	0,22	8	526	27
34	KC1-0,38-25-3Y3 (1Y3, 2Y3)	0,38	25	551	27
35	KC1-0,66-25-3Y3 (1Y3, 2Y3)	0,66	25	183	28
36	KC1-0,22-8-3Y3 (1Y1, 2Y1)	0,22	8	526	27
37	KC1-0,38-20-3Y1 (1Y1, 2Y1)	0,38	20	441	27
38	KC1-0,66-20-3Y1 (1Y1, 2Y1)	0,66	20	146	27
39	KC1-1,05-37,5-2Y3 (1Y3)	1,05	37,5	108	28
40	KC1-3,15-37,5-2Y3 (1Y3)	3,15	37,5	12	28
41	KC1-6,3-37,5-2Y3 (1Y3)	6,3	37,5	3	29
42	KC1-10,5-37,5-2Y3 (1Y3)	10,5	37,5	1	29
43	KC1-1,05-30-2Y1 (1Y1)	1,05	30	86,7	28
44	KC1-3,15-30-2Y1 (1Y1)	3,15	30	10	28
45	KC1-6,3-30-2Y1 (1Y1)	6,3	30	2	29
46	KC1-10,5-30-2Y1 (1Y1)	10,5	30	1	29
47	KC2-0,22-16-3Y3 (1Y3, 2Y3)	0,22	16	1052	54
48	KC2-0,38-32-3Y3 (1Y3, 2Y3)	0,38	50	1102	54
49	KC2-0,66-50-3Y3 (1Y3, 2Y3)	0,66	50	366	55
50	KC2-0,22-16-3Y1 (1Y1, 2Y1)	0,22	16	1052	54
51	KC2-0,38-40-3Y1 (1Y1, 2Y1)	0,38	40	882	54
52	KC2-0,66-40-3Y1 (1Y1, 2Y1)	0,66	40	292	55
53	KC2-1,05-75-2Y3 (1Y3)	1,05	75	217	56
54	KC2-3,15-75-2Y3 (1Y3)	3,15	75	24	57
55	KC2-6,3-75-2Y3 (1Y3)	6,3	75	6	57
56	KC2-10,5-75-2Y3 (1Y3)	10,5	75	2	56
57	KC2-1,05-60-2Y1 (1Y1)	1,05	60	173	56
58	KC2-3,15-60-2Y1 (1Y1)	3,15	60	19	57
59	KC2-6,3-60-2Y1 (1Y1)	6,3	60	5	57
60	KC2-10,5-60-2Y1 (1Y1)	10,5	60	2	56
Series III (t 45°C)					
61	KC1-0,22-8-3Y3 (1Y3, 2Y3)	0,22	8	526	27
62	KC1-0,38-22,5-3Y3 (1Y3, 2Y3)	0,38	22,5	496	27
63	KC1-0,66-22,5-3Y3 (1Y3, 2Y3)	0,66	22,5	165	28
64	KC1-1,05-34-2Y3 (1Y3)	1,05	34	98,2	28
65	KC1-3,15-34-2Y3 (1Y3)	3,15	34	10,9	28
66	KC1-6,3-34-2Y3 (1Y3)	6,3	34	2,73	29
67	KC1-10,5-34-2Y3 (1Y3)	10,5	34	0,982	29
68	KC2-0,22-16-3Y3 (1Y3, 2Y3)	0,22	16	1052	54
69	KC2-0,38-45-3Y3 (1Y3, 2Y3)	0,38	45	992	54
70	KC2-0,66-45-3Y3 (1Y3, 2Y3)	0,66	45	330	55
71	KC2-1,05-67-2Y3 (1Y3)	1,05	67	194	56
72	KC2-3,15-67-2Y3 (1Y3)	3,15	67	21,5	57
73	KC2-6,3-67-2Y3 (1Y3)	6,3	67	5,38	57
74	KC2-10,5-67-2Y3 (1Y3)	10,5	67	1,94	57
Series III (t 50°C)					
75	KC1-0,22-8-3Y3 (1Y3, 2Y3)	0,22	8	526	27

76	KC1-0,38-20-3Y3 (1Y3, 2Y3)	0,38	20	441	27
77	KC1-0,66-20-3Y3 (1Y3, 2Y3)	0,66	20	146	28
78	KC1-1,05-30-2Y3 (1Y3)	1,05	30	86,7	28
79	KC1-3,15-30-2Y3 (1Y3)	3,15	30	9,63	28
80	KC1-6,3-30-2Y3 (1Y3)	6,3	30	2,41	29
81	KC1-10,5-30-2Y3 (1Y3)	10,5	30	0,867	29
82	KC2-0,22-16-3Y3 (1Y3, 2Y3)	0,22	16	1052	54
83	KC2-0,38-40-3Y3 (1Y3, 2Y3)	0,38	40	882	54
84	KC2-0,66-40-3Y3(1Y3, 2Y3)	0,66	40	292	55
85	KC2-1,05-60-2Y3 (1Y3)	1,05	60	173	56
86	KC2-3,15-60-2Y3 (1Y3)	3,15	60	19,3	57
87	KC2-6,3-60-2Y3 (1Y3)	6,3	60	4,82	57
88	KC2-10,5-60-2Y3 (1Y3)	10,5	60	1,73	57
Series IV					
89	KC0-0,22-4-3Y3 (1Y3, 2Y3)	0,22	4	260	17
90	KC0-0,22-4-3Y1 (1Y1, 2Y1)	0,22	4	260	17
91	KC0-0,38-12,5-3Y3 (1Y3, 2Y3)	0,38	12,5	276	17
92	KC0-0,38-12,5-3Y1 (1Y1, 2Y1)	0,38	12,5	276	17
92	KC0-0,66-12,5-3Y3 (1Y3, 2Y3)	0,66	12,5	92	17
94	KC0-0,66-12,5-3Y1 (1Y1, 2Y1)	0,66	12,5	92	17
95	KC0-3,15-25-2Y3 (1Y3)	3,15	25	8	18
96	KC0-3,15-25-2Y1 (1Y1)	3,15	25	8	18
97	KC0-6,3-25-2Y3 (1Y3)	6,3	25	2	18
98	KC0-6,3-25-2Y1 (1Y1)	6,3	25	2	18
99	KC0-10,5-25-2Y3 (1Y3)	10,5	25	1	18
100	KC0-10,5-25-2Y1 (1Y1)	10,5	25	1	18
101	KC1-3,15-50-2Y3 (1Y3)	3,15	50	16	28
102	KC1-6,3-50-2Y3 (1Y3)	6,3	50	4	29
103	KC1-10,5-50-2Y3 (Y3)	10,5	50	1,45	29
104	KC1-3,15-37,5-2Y1 (1Y1)	3,15	37,5	12	28
105	KC1-6,3-37,5-2Y1 (1Y1)	6,3	37,5	3	29
106	KC1-10,5-37,5-2Y1 (2Y1)	10,5	37,5	1,1	28
107	KC2-3,15-100-2Y3 (1Y3)	3,15	100	32,9	57
108	KC2-6,3-100-2Y3 (1Y3)	6,3	100	8	57
109	KC2-10,5-100-2Y3 (1Y3)	10,5	100	2,9	57
110	KC2-3,15-75-2Y1 (1Y1)	3,5	75	24	57
111	KC2-6,3-75-2Y1(1Y1)	6,3	75	6	57
112	KC2-10,5-100-2Y1 (1Y1)	10,5	75	2,2	57
Capacitors for tropic climate with 50 Hz frequency					
Series II (t 45°C)					
113	KC1-0,38-16-3T3 (1T3, 2T3)	0,38	16	353	27
114	KC1-0,38-16-3T2 (1T2, 2T2)	0,38	16	353	27
115	KC1-0,40-16-3T3 (1T3, 2T3)	0,40	16	318	27
116	KC1-0,40-16-3T2 (1T2, 2T2)	0,40	16	318	27
117	KC1-0,44-16-3T3 (1T3, 2T3)	0,44	16	263	27
118	KC1-0,44-16-3T2 (1T2, 2T2)	0,44	16	263	27
119	KC1-0,50-16-3T3 (1T3, 2T3)	0,50	16	204	28
120	KC1-0,50-16-3T2 (1T3, 2T2)	0,50	16	204	28
121	KC2-0,38-32-3T3 (1T3, 2T3)	0,38	32	706	54

122	KC2-0,38-32-3T2 (1T2, 2T2)	0,38	32	706	54
123	KC2-0,40-32-3T3 (1T3, 2T3)	0,40	32	636	54
124	KC2-0,40-32-3T2 (1T2, 2T2)	0,40	32	636	54
125	KC2-0,44-32-3T3 (1T3, 2T3)	0,44	32	526	54
126	KC2-0,44-32-3T2 (1T2, 2T2)	0,44	32	526	54
127	KC2-0,50-32-3T3 (1T3, 2T3)	0,50	32	408	55
128	KC2-0,50-32-3T2 (1T2, 2T2)	0,50	32	408	55
Series II (t 50°C)					
129	KC1-0,22-6-3T3 (1T3, 2T3)	0,22	6	395	27
130	KC1-0,22-6-3T2 (1T2, 2T2)	0,22	6	395	27
131	KC1-0,23-6-3T3 (1T3, 2T3)	0,23	6	360	27
132	KC1-0,23-6-3T2 (1T2, 2T2)	0,23	6	360	27
133	KC1-0,38-14-3T3 (1T3, 2T3)	0,38	14	309	27
134	KC1-0,38-14-3T2 (1T2, 2T2)	0,38	14	309	27
135	KC1-0,40-14-3T3 (1T3, 2T3)	0,40	14	279	27
136	KC1-0,40-14-3T2 (1T2, 2T2)	0,40	14	279	27
137	KC1-0,415-14-3T3 (1T3, 2T3)	0,415	14	260	27
138	KC1-0,415-14-3T2 (1T2, 2T2)	0,415	14	260	27
139	KC1-0,44-14-3T3 (1T3, 2T3)	0,44	14	230	27
140	KC1-0,50-14-3T3 (1T3, 2T3)	0,50	14	178	27
141	KC1-0,50-14-3T2 (1T2, 2T2)	0,50	14	178	27
142	KC2-0,22-12-3T3 (1T3, 2T3)	0,22	12	790	54
143	KC2-0,22-12-3T2 (1T2, 2T2)	0,22	12	790	54
144	KC2-0,23-12-3T3 (1T3, 2T3)	0,23	12	722	54
145	KC2-0,23-12-3T2 (1T2, 2T2)	0,23	12	722	54
146	KC2-0,38-28-3T3 (1T3, 2T3)	0,38	28	618	54
147	KC2-0,38-28-3T2 (1T2, 2T2)	0,38	28	618	54
148	KC2-0,40-28-3T3 (1T3, 2T3)	0,40	28	556	54
149	KC2-0,40-28-3T2 (1T2, 2T2)	0,40	28	556	54
150	KC2-0,415-28-3T3 (1T3, 2T3)	0,415	28	518	54
151	KC2-0,415-28-3T2 (1T2, 2T2)	0,415	28	518	54
152	KC2-0,44-28-3T3 (1T3, 2T3)	0,44	28	460	54
153	KC2-0,50-28-3T3 (1T3, 2T3)	0,50	28	356	54
154	KC2-0,50-28-3T2 (1T2, 2T2)	0,50	28	356	54
Series III (t 45°C)					
155	KC1-0,38-22,5-3T3 (2T3)	0,38	22,5	496	27
156	KC1-0,38-22,5-3T2 (2T2)	0,38	22,5	496	27
157	KC1-0,40-22,5-3T3 (2T3)	0,40	22,5	448	27
158	KC1-0,40-22,5-3T2 (2T2)	0,40	22,5	448	27
159	KC1-0,44-22,5-3T3 (2T3)	0,44	22,5	369	27
160	KC1-0,44-22,5-3T2 (2T2)	0,44	22,5	369	27
161	KC1-0,66-22,5-3T3 (2T3)	0,66	22,5	165	28
162	KC1-0,66-22,5-3T2 (2T2)	0,66	22,5	165	28
163	KC2-0,38-45-3T3 (2T3)	0,38	45	990	54
164	KC2-0,38-45-3T2 (2T2)	0,38	45	990	54
165	KC2-0,40-45-3T3 (2T3)	0,40	45	896	54
166	KC2-0,40-45-3T2 (2T2)	0,40	45	896	54
167	KC2-0,44-45-3T3 (2T3)	0,44	45	738	54
168	KC2-0,44-45-3T2 (2T2)	0,44	45	738	54

169	KC2-0,66-45-3T3 (2T3)	0,66	45	330	55
170	KC2-0,66-45-3T2 (2T2)	0,66	45	330	55
171	KC1-1,05-34-2T3	1,05	34	98	28
172	KC1-1,05-34-2T2	1,0	34	98	2,8
173	KC1-3,15-34-2T3	3,15	34	10,9	28
174	KC1-3,15-34-2T2	3,15	34	10,9	28
175	KC1-6,3-34-2T3	6,3	34	273	29
176	KC1-6,3-34-2T2	6,3	34	2,73	29
177	KC1-6,6-34-2T3	6,6	34	2,49	29
178	KC1-6,6-34-2T2	6,6	34	2,49	29
179	KC1-10,5-34-2T3	10,5	34	0,98	29
180	KC1-10,5-34-2T2	10,5	34	0,98	29
181	KC1-11-34-2T3	11	34	0,89	29
182	KC1-11-34-2T2	11	34	0,89	29
183	KC2-1,05-67-2T3	1,05	67	193	56
184	KC2-1,05-67-2T2	1,05	67	193	56
185	KC2-3,15-67-2T3	3,15	67	21,5	57
186	KC2-3,15-67-2T2	3,15	67	21,5	57
187	KC2-6,3-67-2T3	6,3	67	5,37	57
188	KC2-6,3-67-2T2	6,3	67	5,37	57
189	KC2-6,6-67-2T3	6,6	67	4,9	57
190	KC2-6,6-67-2T2	6,6	67	4,9	57
191	KC2-10,5-67-2T3	10,5	67	1,93	57
192	KC2-10,5-67-2T2	10,5	67	1,93	57
193	KC2-11-67-2T3	11	67	1,76	57
194	KC2-11-67-2T2	11	67	1,76	57

Series III (t 50°C)

195	KC1-0,22-8-3T3 (2T3)	0,22	8	526	27
196	KC1-0,22-8-3T2 (2T2)	0,22	8	526	27
197	KC1-0,23-9-3T3 (2T3)	0,23	9	542	27
198	KC1-0,23-9-3T2 (2T2)	0,23	9	542	27
199	KC1-0,24-10-3T3 (2T3)	0,24	10	552	27
200	KC1-0,24-10-3T2 (2T2)	0,24	10	552	27
201	KC1-0,38-20-3T3 (2T3)	0,38	20	441	27
202	KC1-0,38-20-3T2 (2T2)	0,38	20	441	27
203	KC1-0,415-20-3T3 (2T3)	0,415	20	369	27
204	KC1-0,415-20-3T2 (2T2)	0,415	20	369	27
205	KC1-0,44-14-3T3	0,44	14	230	27
206	KC1-0,66-20-3T3	0,66	20	146	28
207	KC1-0,66-20-3T2 (2T2)	0,66	20	146	28
208	KC2-0,22-16-3T3 (2T3)	0,22	16	1052	54
209	KC 2-0,22-16-3T2 (2T2)	0,22	16	1052	54
210	KC2-0,23-18-3T3 (2T3)	0,23	18	1086	54
212	KC2-0,23-18-3T2 (2T2)	0,23	18	186	54
213	KC2-0,24-20-3T3 (2T3)	0,24	20	1106	54
214	KC2-0,24-20-3T2 (2T2)	0,24	20	1106	54
215	KC2-0,38-40-3T3 (2T3)	0,38	40	882	54
216	KC2-0,38-40-3T2 (2T2)	0,38	40	882	54
217	KC2-0,415-40-3T3 (2T3)	0,415	40	738	54
218	KC2-0,415-40-3T2 (2T2)	0,415	40	738	54
219	KC2-0,44-28-3T2	0,44	28	459	54
220	KC2-0,66-40-3T3	0,66	40	292	55
221	KC2-0,66-40-3T2	0,66	40	292	55
222	KC2-1,05-30-1T3	1,05	30	86,5	56

223	KC1-1,05-30-2T2	1,05	30	86,5	28
224	KC1-3,15-30-2T3	3,15	30	9,63	28
225	KC1-3,15-30-2T2	3,15	30	9,63	28
226	KC1-6,3-30-2T3	6,3	30	2,4	29
227	KC1-6,3-30-2T2	6,3	30	2,4	29
228	KC1-10,5-30-2T3	10,5	30	0,87	29
229	KC1-10,5-30-2T2	10,5	30	0,87	29
230	KC2-1,05-60-2T3	1,05	60	173	56
231	KC2-1,05-60-2T2	1,05	60	173	56
232	KC2-3,15-60-2T2	3,15	60	19,3	51
233	KC2-3,15-60-2T2	3,15	60	19,3	57
234	KC2-6,3-60-2T3	6,3	60	4,8	57
235	KC2-6,3-60-2T2	6,3	60	4,8	57
236	KC2-10,5-60-2T3	10,5	60	1,74	57
237	KC2-10,5-60-2T2	10,5	60	1,74	57
Series IV (t 45°C)					
238	KC1-6,6-40-2T3	6,6	40	2,92	29
239	KC1-6,6-40-2T2	6,6	40	2,92	29
240	KC2-6,6-80-2T3	6,6	80	5,84	57
241	KC2-6,6-80-2T2	6,6	80	5,84	57
242	KC1-11-40-2T3	11	40	1,05	29
243	KC1-11-40-2T2	11	40	1,05	29
244	KC2-11-80-2T3	11	80	2,1	56
245	KC2-11-80-2T2	11	80	2,1	56

2. Cosine capacitors of model KCK for power factor increase in electric plants with alternating current and 50 (60) Hz frequency

Weight of capacitors: zero size - under 30 kg, second size – under 60 kg. Dielectric – polypropylene film and trichlorobiphenyl impregnated capacitor paper.

Manufacturer of such capacitors – Ust-Kamenogorsk capacitor plant.

№	Model of the capacitor	Ratings			
		Voltage, кV	Power, kilovar	Capacity, μF	Weight, кг
1	KCK1-0,66-40-3Y1	0,66	40	292	27
2	KCK1-1,05-63-2Y1	1,05	63	182	27
3	KCK1-3,15-75-2Y1	3,15	75	24	27
4	KCK1-6,3-75-2Y1	6,3	75	6	27
5	KCK1-10,5-75-2Y1	10,5	75	2,2	27
6	KCK2-0,66-80-3Y1	0,66	80	584	54
7	KCK2-1,05-125-2Y1	1,05	125	364	54
8	KCK2-3,15-150-2Y1	3,15	150	48	54
9	KCK2-6,3-150-2Y1	6,3	150	12	54
10	KCK2-10,5-2Y1	10,5	150	44	54

3. Capacitors for electric thermal plants with frequency ranging from 0,5 kHz to 10,0 kHz

The weight of capacitors of this model is under 35 kg. Dielectric – trichlorobiphenyl impregnated capacitor paper (in capacitors with letter «K» - propylene film and trichlorobiphenyl impregnated capacitor paper).

Manufacturer of capacitors listed in the table under №№ 1...45- Ust-Kamenogorsk capacitor plant, under №№ 46...54 - Serpukhov research plant «Kondensator».

№	Model of the capacitor	Ratings			
		Voltage, кV	Frequency, kHz	Power, Kilovar	Capacity, μF
1	ЭCB-0,8-0,5-2Y3	0,8	0,5	200	99,5
2	ЭCB-1,0-0,5-2Y3	1,0	0,5	200	63,6
3	ЭCB-1,6-0,5-2Y3	1,6	0,5	200	24,9
4	ЭCB-2,0-0,5-2Y3	1,8	0,5	200	15,91
5	ЭCB-0,8-1-2Y3	0,8	1	250	62,2
6	ЭCB-1,0-1-2Y3	1,0	1	250	39,8
7	ЭCB-1,6-1-2Y3	1,6	1	250	15,55
8	ЭCB-2,0-1-2Y3	2,0	1	250	9,95
9	ЭCB-0,5-2,4-2Y3	0,5	2,4	300	79,6
10	ЭCB-0,8-2,4-2Y3	0,8	2,4	300	31,2
11	ЭCBП-0,8-2,4-2Y3	0,8	2,4	300	31,2
12	ЭCB-1,0-2,4-2Y3	1,0	2,4	300	19,9
13	ЭCBП-1,0-2,4-2Y3	1,0	2,4	300	19,9
14	ЭCB-1,6-2,4-2Y3	1,6	2,4	300	7,8
15	ЭCB-2,0-2,4-2Y3	2,0	2,4	300	4,97
16	ЭCB-0,5-4-2Y3	0,5	4	350	55,7
17	ЭCB-0,8-4-2Y3	0,8	4	350	21,8
18	ЭCBП-0,8-4-2Y3	0,8	4	350	21,8
19	ЭCB-1,0-4-2Y3	1,0	4	350	13,9
20	ЭCBП-1,0-4-2Y3	1,0	4	350	13,9
21	ЭCB-1,6-4-2Y3	1,6	4	350	5,45
22	ЭCB-2,0-4-2Y3	2,0	4	350	3,48

23	ЭСВ-0,5-10-2У3	0,5	10	400	25,5
24	ЭСВ-0,8-10-2У3	0,8	10	400	9,96
25	ЭСВП-0,8-10-2У3	0,8	10	400	9,96
26	ЭСВК-0,8-0,5-У3	0,8	0,5	300	149,3
27	ЭСВК-1,0-0,5-У3	1,0	0,5	300	95,5
28	ЭСВК-1,6-0,5-У3	1,6	0,5	300	37,3
29	ЭСВК-2,0-0,5-У3	2,0	0,5	300	23,9
30	ЭСВК-0,8-1-У3	0,8	1	450	112,0
31	ЭСВК-1,0-1-У3	1,0	1	450	71,7
32	ЭСВК-1,6-1-У3	1,6	1	450	28,0
33	ПЭСВК-2,0-1-У3	2,0	1	450	17,9
34	ЭСВК-0,5-2,4-У3	0,5	2,4	550	146,0
35	ЭСВК-6,8-2,4-У3	0,8	2,4	550	57,0
36	ЭСВК-1,0-2,4-У3	1,0	2,4	550	36,5
37	ЭСВК-1,6-2,4-У3	1,6	2,4	550	14,25
38	ЭСВК-2,0-2,4-У3	2,0	2,4	550	9,1
39	ЭСВК-0,5-4-У3	0,5	4	550	87,58
40	ЭСВК-0,8-4-У3	0,8	4	550	34,21
41	ЭСВК-1,0-4-У3	1,0	4	550	21,89
42	ЭСВК-1,6-4-У3	1,6	4	550	8,55
43	ЭСВК-2,0-4-У3	2,0	4	550	5,47
44	ЭСВК-0,5-10-У3	0,5	10	650	41,4
45	ЭСВК-0,8-10-У3	0,8	10	650	16,17
46	ЭС750-0,5-У3	0,75	0,5	35	19,8
47	ЭС1000-0,5-У3	1,0	0,5	35	11,2
48	ЭС1500-0,5-У3	1,5	0,5	35	4,95
49	ЭС2000-0,5-У3	2,0	0,5	35	2,8
50	ЭС500-1-У3	0,5	1	35	22,2
51	ЭС750-1-У3	0,75	1	35	9,9
52	ЭС1000-1-У3	1,0	1	35	5,6
53	ЭС1500-1-У3	1,5	1	35	2,48
54	ЭС400-1,5x3-У3	0,4	1,5	27	18,0

4. Capacitors to be used in batteries of induction furnaces or other electric thermal plants with 50 Hz frequency.

The weight of capacitors of this model is under 52 kg. Dielectric – trichlorobiphenyl impregnated capacitor paper (in capacitors with letter «К» - propylene film and trichlorobiphenyl impregnated capacitor paper).

Manufacturer - Ust-Kamenogorsk capacitor plant.

№	Model of the Capacitor	Ratings			
		Voltage, кW	Frequency, Hz	Power, Kilovar	Capacity, μF
1	КСЭ-1,05-75-У4	1,05	50	75	217
2	КСЭК-1,2-150-У3	1,2	50	50	332

5. Capacitors for power factor increase in ship electric plants with alternating current of 50 Hz frequency

Dielectric – trichlorobiphenyl impregnated capacitor paper.

Manufacturer – Ust-Kamenogorsk capacitor plant.

№	Model of the capacitor	Ratings			
		Voltage, κW	Power, kilovar	Capacity, μF	Weight, kg
1	KC1-0,4-15-OM4	0,4	15	298,5	32
2	KC2-0,4-15-OM4	0,4	15	298,5	32
3	KC1-0,4-30-OM4	0,4	30	597	32
4	KC2-0,4-30-OM4	0,4	30	597	32

6. Capacitors for power factor increase in TDK-500 welding transformer

Weight of the capacitor is under 19 kg. Dielectric – trichlorobiphenyl impregnated capacitor paper.

Manufacturer – Ust-Kamenogorsk capacitor plant.

№	Model of the capacitor	Ratings			
		Voltage, κW	Frequency, Hz	Power, Kilovar	Capacity, μF
1	1. KCTC-0,38-9,4Y2	0,38	50	9,4	207

7. Capacitors for assembling batteries with longitudinal compensation of reactive resistance in power transmission lines

Dielectric – trichlorobiphenyl impregnated capacitor paper. Manufacturer – Ust-Kamenogorsk capacitor plant.

№	Model of the capacitor	Ratings			
		Voltage, κW	Power, Kilovar	Capacity, μF	Weight, kg
1	KCII-0,66-40-Y1	0,66	40	282	54
2	KCII-1,05-75-Y1	1,05	75	217	55
3	KCII-1,05-120-Y3	1,05	120	348	55

8. Capacitors for shunt batteries of direct power transmission lines

Dielectric – trichlorobiphenyl impregnated capacitor paper (in capacitors with letter «K» - propylene film and trichlorobiphenyl impregnated capacitor paper).

Manufacturer - Ust-Kamenogorsk capacitor plant.

№	Model of the capacitor	Ratings			
		Voltage, κW	Power, Kilovar	Capacity, μF	Weight, kg
1	KCIII-6,3-50Y1	6,3	50	4	55
2	KCIIIK-6,3-100Y1	6,3	100	8	55

9. Tuned capacitors for filter batteries of power transmission lines and power filters of higher harmonics operating in static capacitors and capacitor facilities

Dielectric – trichlorobiphenyl impregnated capacitor paper (in capacitors with letter «K» - propylene film and trichlorobiphenyl impregnated capacitor paper).

Manufacturer - Ust-Kamenogorsk capacitor plant.

№	Model of the capacitor	Ratings			
		Voltage, κW	Power, Kilovar	Capacity, μF	Weight, kg
1	KCΦ-6,3-50-Y1	6,3	50	4,0	55
2	KCKΦ-4,4-150-2Y1	4,4	150	24,7	52
3	KCKΦ-6,6-150-2Y1	6,6	150	11,0	52
4	KCKΦ-7,3-150-2Y1	7,3	150	9,0	52

10. Capacitors for circuits of one-phase induction motors

№	Model of the capacitor	Ratings			
		Voltage, W	Power, kilovar	Capacity, μF	Weight, kg
1	БКC 250/400-30/3,3-T4	250/400	30+3,3	3,3	1,65
2	БКC 250/400-60/4,7-T4	250/400	60+4,7	4,7	2,7

11. Capacitors for circuits of auxiliary machines in electric locomotives with alternating current

Dielectric – trichlorobiphenyl impregnated capacitor paper (in capacitors with letter «K» - propylene film and trichlorobiphenyl impregnated capacitor paper).

Manufacturer – Serpukhov research plant “Kondensator”.

№	Model of the capacitor	Ratings			
		Voltage, κW	Power, kilovar	Capacity, μF	Weight, kg
1	KC-0,5-19-O2	0,5	19	242	27
2	KCK-0,5-38-O2	0,5	38	484	30

12. Capacitors for circuits of thyristor drives in the rolling-stock of electric transport

Dielectric – trichlorobiphenyl impregnated capacitor paper.

Manufacturer – Serpukhov research plant “Kondensator”.

№	Model of the capacitor	Ratings				
		Direct Current Voltage, κW	Alternating current voltage, κW	Frequency, kHz	Capacity, μF	Weight, kg
1	ΦСТ-0,75-300У3	0,75	-	-	300	33
2	ΦСТ-2,1-160У2	2,1	-	-	160	
3	ΦСТ-4-40-У2	4,0	-	-	40	
4	ΦС-1-600У2	1,0	-	-	600	30
5	ГСТ-1-50У2		-	-	50	33
6	РСТ-2-2,12У2	3,15	2,0	0,8	2,12	30
7	РСТ-2-4У2			0,4	4,0	
8	РСТО-2-6,15У2			0,4	6,15	

13. Capacitors for semiconductor frequency converters

Dielectric – trichlorobiphenyl impregnated capacitor paper (in capacitors with letter «К» - propylene film and trichlorobiphenyl impregnated capacitor paper).

Manufacturer – Serpukhov research plant “Kondensator”.

№	Model of the capacitor	Ratings			
		Voltage, κW	Frequency, Hz	Capacity, μF	Weight, kg
1	ПС-0,3-0,4У2	0,3	400	50	6
2	ПСК-0,4-30У2	0,4	250	30	6
3	ПСК-0,4-90У2	0,4	250	90	16
4	ПСК-0,65-36У2	0,65	70	36	6
5	ПСК-0,7-20У2	0,7	70	20	6
6	ПСК-0,7-30У2	0,7	70	30	6
7	ПСК-1,25-200У2	1,25	60	200	30
8	ПСК-1,6-100У2	1,6	100	100	30
9	ПСК-4,5-4У2	4,5	100	4	30

14. Impulse capacitors

Dielectric – nitrosovol impregnated capacitor paper (mixture of pentachlorobiphenyl and alphanitronaphthalene).

Manufacturer – Serpukhov research plant “Kondensator”.

№	Model of the capacitor	Ratings		
		Voltage, κW	Capacity, μF	Weight, kg

1	ИС-20-0,5УЗ	20	0,5	28
2	ИС-16-0,8УЗ	16	0,8	28
3	ИС-20-6,65	20	6,65	46
4	ИС-6-5,5УЗ	6	5,5	28
5	ИС-4-13УЗ	4	13	28
6	ИС-2-52УЗ	2	52	28
7	ИС-25-13УХЛ4	25	13	120
8	ИС-5-200У2	5	200	55
9	ИС-6-200УХЛ2	6	200	54
10	ИС-2,8-300У3	2,8	300	55

Regulatory framework

1. GOST №12.3.002-75 "Manufacturing processes and general safety requirements", Occupational Safety Standards;
2. GOST №15.001—73 "Development and manufacturing of goods. General requirements";
3. GOST №12.2.003-91 "Manufacturing equipment. General safety requirements", Occupational Safety Standards;
4. Industry Guidelines №34.46.501 – 2003 "Power transformers. Standard operating guidelines";
5. GOST №16555-75 "Power three-phase hermetic oil-filled transformers with nonflammable liquid dielectric";
6. GOST №14209-69 "Power oil-filled transformers (and autotransformers). Capacity and performance Нагрузочная способность";
7. "Technical operation of power plants and networks. Rules ", approved by the Ministry of Fuel and Energy of Ukraine on June 13, 2003 № 296.
8. Standard of Ukraine's Organization № 40.1-21677681-07:2009 "Power transformers. Standard operating guidelines";
9. Standard of Ukraine's Organization №46.501-2006 "Diagnostics of oil-filled transformer equipment based on the results of chromatographic analysis of free gas samples from gas relay and gases dissolved in insulating oil" of the Ministry of Fuel and Energy of Ukraine;
10. Standard of Ukraine's Organization №43.101:2009 "Application and operation of transformer oils. Quality assessment standards";
11. Rules for technical operation of consumers' electrical equipment approved by the Ministry of Fuel and Energy of Ukraine on 25.07.2006 №258 (as amended by decree of the Ministry of Energy and Coal Industry of Ukraine on 13.02.2012 № 91) registered in the Ministry of Justice of Ukraine on October 25, 2006 № 1143/13017;
12. Industry standard №6-01-43-7 "Electrical insulating liquids. Trichlorodiphenyl. Technical parameters";
13. Industry standard №6-01-17-74 "Electrical insulating liquids. Sovtol-10";
14. GOST №16555-75 "Production of transformers filled with toxic PCBs".