free of flammable material. Ensure that the limit stat is connected and is serviced at regular intervals to ensure it will operate correctly when required.

4. Incorrect air supply/ fuel ratios. Good maintenance of biomass boilers will maximise their operational lifetime. Over time, the air to fuel ratio in the boiler can drift due to fans not being as effective, or oxygen and temperature sensors becoming less accurate. This causes problems with control of air and fuel rates which could either result in too much oxygen being supplied to the boiler which has the result of lowering efficiency or too little oxygen supplied to the boiler which can lead to incomplete combustion. High levels of CO and tar due to incomplete combustion can lead to damage of the boiler internals, or to an increase of particulate emissions and damage to flues.

In conclusion it should be noted that to solve problems caused by poor maintenance a maintenance plan and schedule are as essential as is operator training. The operator should be trained on how to operate and maintain the boiler according to the manufacturer's recommendations. In general biomass boiler operators must be proactive about repairs and fix problems as they arise and not allow them to deteriorate. They should observe their boiler for a period of time and see if its behaviour changes over the long-term. A good maintenance log will allow subtle changes that happen gradually to become noticeable. Boiler maintenance duties should be carried out according to the schedule.

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INSTALLATION AND MAINTENANCE OF HIGH VOLTAGE POWER LINES

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Abstract. The article deals with the main stages of installation and maintenance of high voltage power lines. The purpose of the study is to determine the features of

work aimed at ensuring the proper conditions of electrical equipment. The article also discusses the list of works during major repairs of high voltage power lines.

Keywords: transformer substations; power transmission lines; electrical network; overhead line; major repairs; grounding devices; conductors.

Electrical energy is universal. It is convenient for long-distance transmissions. Electrical energy is easily distributed to individual consumers and is converted to other types of energy using relatively simple devices.

The part of the power system that includes transformer substations (TP) and power transmission lines (LEP) is called the electric grid. Thus, the electric network serves for the transmission of electrical energy from places of production to places of consumption and for its distribution to groups and individual consumers.

Electric networks are classified according to various characteristics. Depending on the voltage between the line wires, there are networks with a voltage of up to 1000 and more than 1000 V.

According to the type of current, electric networks of direct, single-phase and three-phase currents are distinguished.

Depending on the design features, there are overhead and cable networks, as well as networks inside buildings and objects.

The main requirements for electric networks are reduced to saving electrical materials and reducing initial costs with guaranteed reliability of the power grid and high quality of electricity. To meet these requirements, a number of measures have been developed, which include, in particular, the use of high-voltage steel wires, voltage regulation.

Maintenance of electrical networks means that all the necessary work is performed in the complex of works aimed at maintaining the ability to work and preventing premature operation of elements of the object of electrical networks. This is achieved by inspections, performing preventive checks and measurements, and certain types of work with the replacement of worked parts and elements of electrical networks, eliminating damage.

If the overhead line consists of wooden and reinforced concrete supports and the advantage is made up of wooden supports, then major repairs should be carried out 1 time in 5 years.

The system of maintenance and repair of electrical networks provides for the implementation of a set of works that are carried out with a certain frequency and sequence, aimed at ensuring the serviceable condition of electrical equipment, its reliable and economic operation at optimal labor and material costs. The complex of works mainly includes well-organized maintenance of electrical equipment; establishing the optimal frequency of major repairs; introduction of progressive forms of organization and management of electrical equipment repair; implementation of repair work specialization; quality control of work performed during the repair process; timely provision of repair works with materials, spare parts and accessories; analysis of technical condition parameters of equipment before and after repair. There are two types of mainte-

nance: predictive and preventing. The aim of predictive maintenance is to predict when equipment failure might occur, and secondly, to prevent occurrence of the failure by performing any required maintenance. The task of monitoring for future failure allows maintenance to be planned before the failure occurs. Predicting failure can be done with one of many techniques. The chosen technique must be effective at predicting failure and also provide sufficient warning time for maintenance to be planned and executed. The techniques include vibration analysis, oil analysis, thermal imaging, and equipment observation. This helps minimize the time the equipment is being maintained, the production hours lost to maintenance, and the cost of spare parts and supplies.

Preventive maintenance means the care and servicing by personnel for the purpose of maintaining equipment and facilities in satisfactory operating condition by providing for systematic inspection, detection, and correction of incipient failures either before they occur or before they develop into major defects. Maintenance, including tests, measurements, adjustments, and parts replacement, performed specifically to prevent faults from occurring. Maintenance at fixed intervals is the most frequently used approach, and strategies based on reliability centered maintenance (RCM) are increasingly considered for application. This can be observed recently in some applications of RCM in transmission systems approach to an optimal maintenance strategy in transmission systems using a genetic algorithm/

Specific terms of repairs are set depending on the technical mill of the electrical object and the available material and technical resources. The priority of objects when planning repairs is set taking into account the requirements and reliability of power supply of consumers.

Some of the works performed during major repairs of overhead lines may include the complex works on maintenance; cleaning the road from bushes and fallen trees; cutting down trees that threaten to fall on wires; installation of bollards; replacement of supports; wire hauling to residential buildings and industrial buildings and structures (installation and replacement of connectors, repair couplings, bandages).

Grounding devices intended for re-grounding, protection from lightning overvoltage, and grounding of electrical equipment installed on overhead line supports must be installed on overhead line supports. The resistance of the grounding device must not exceed 30 Ohms.

Metal supports, metal structures and reinforcement of reinforced concrete elements of supports must be connected to the PEN-conductor.

On reinforced concrete supports, the PEN-conductor should be attached to the reinforcement of reinforced concrete struts and struts of supports.

Hooks and pins are wooden poles with overhead lines, and metal or concrete poles if the suspension on them SIP with insulated main conductor or all conductors carrying harness ground are not permitted, with the exception of the hooks and pins on the supports, where re-earthing and grounding for protection against atmospheric overvoltage.

Hooks, pins and fittings of overhead line supports with a voltage of up to 1 kV that limit the crossing span, as well as supports on which joint suspension is performed, must be grounded.

Overhead lines on wooden poles when crossing the cable line ground wire must be attached to PEN-conductor overhead lines and the metal sheath of the cable.

Protective devices installed on overhead line supports to protect against lightning surges must be connected to the ground conductor by a separate descent.

Connection of grounding conductors among themselves, their connection to the upper grounding outlets of racks of reinforced concrete supports, to hooks and brackets, as well as to grounded metal structures and to grounded electrical equipment installed on overhead line supports, must be performed by welding or bolted connections. The connection of the grounding conductors to the earthing device in the ground must also be performed by welding or have bolted connections.

In populated areas with one – and two-story buildings, overhead lines must have grounding devices designed to protect them from atmospheric overvoltage. The resistances of these grounding devices should not exceed 30 Ohms, and the distances between them should not exceed 200 m for areas with the number of thunderstorms per year up to 40, 100 m for areas with the number of thunderstorms per year more than 40.

In conclusion it should be noted that overhead high voltage power lines are a common choice for power transmission. Maintenance strategy of overhead lines based on monitoring data gives actual information regarding fault location, situation, quantified the severity of maintenance of each line. Proper maintenance of high voltage power lines directly improves the quality of service, saves equipment and its associated surrounding.

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Аннотация. В статье рассматриваются общие требования по техническому обслуживанию сельхозтехники при постановке ее на зимнее хранение.