

addition, the intention is to standardize the organization, handling and documentation of maintenance measures such as tests, inspections and maintenance operations.

Another object of the invention is to provide a technical method which makes it easier for a service provider operating a large-scale technical installation on behalf of the customer and for the customer to communicate and place orders. For external customers in particular, the use of the electronic job requirement is a prerequisite for being able to carry out or reject orders in the double-checking principle.

An electronic information system for scheduling likewise makes it possible for the customer and service provider to make resource planning of personnel and objects optimal.

An object of the invention is likewise to provide a technical method which enables standardized procedures when maintaining large-scale technical installations or production facilities and ensures easy access to the maintenance documentation.

An object of the invention is also to ensure structured storage of the results of the maintenance, inspection and test work in a form which is as automated as possible.

In addition, it is an object of the invention to provide a valid system for changing failed maintenance operations, inspections and tests to the maintenance mode and documenting the execution status of the work.

All of these objects are achieved by the maintenance method which is the subject of the invention, comprising the following steps of:

- a) providing a data processing system in which equipment comprising a multiplicity of individual equipment units is recorded in equipment data records and from which the current maintenance, inspection or test status of the recorded equipment units can be retrieved,
- b) using the data processing system to generate at least one digital or non-digital template which relates to a pending maintenance measure and has an equipment identifier which uniquely identifies a particular equipment unit and can be automatically evaluated by the data processing system,
- c) carrying out the maintenance measure on the equipment unit identified by the template generated,
- d) marking the template with a result code which characterizes the result of the maintenance measure carried out and can be automatically evaluated by the data processing system,
- e) transmitting the digital template marked with the result code or an electronic image of the non-digital template marked with the result code to the data processing system, the data

processing system automatically adapting the retrievable current maintenance, inspection or test status using the equipment identifier and the result code for the affected equipment unit.

According to this, provision is first of all made for the equipment comprising a multiplicity of individual equipment units to be recorded in equipment data records in a data processing system and for the current maintenance, inspection or test status of a particular equipment unit to be able to be retrieved. The method therefore assumes that the equipment units, for which the method is intended to be used, are included in a database together with the respectively current maintenance, inspection or test status. The equipment unit and current maintenance, inspection or test status, possibly supplemented with further data, for example the current test instruction, or further detailed test information, form an equipment data record.

In the case of a pending inspection, maintenance or repair measure, a digital or non-digital template relating to the equipment unit to be inspected, maintained, tested or repaired is created via the data processing system. This template may be, in particular, an electronic form or a paper form on which the employee carrying out the measure records the activities carried out. The template has an equipment identifier which uniquely identifies a particular equipment unit and can be automatically evaluated by the data processing system. This may be a numerical and/or letter code, a barcode or the like. In addition to identifying the respective equipment unit, the equipment identifier may also contain further information, for example a date relevant to the measure to be carried out and/or a part which makes it possible to subsequently assign the template to the associated equipment data records.

After the template has been generated, a relevant employee carries out the maintenance, inspection, test or repair measure specified on the template for the relevant specific equipment unit. In this case, the template defines the measure to be carried out according to criteria which have previously been uniformly stipulated for this type of equipment. This ensures that, if a multiplicity of identical equipment units of the same type of equipment are present, the procedure is also standardized when the recurrent, identical measures are carried out by different employees and/or at different times.

After the measure has been carried out, the employee marks the template with a result code which characterizes the result of the measure carried out and can be automatically evaluated by the data processing system. For example, after an inspection which did not reveal any defects in the equipment unit inspected, the employee will mark the template with a result code "OK". Otherwise, if defects to be eliminated have been detected, the template will be marked with a result code which reveals that there are defects, for example "Not OK". Further result codes are provided as control elements for customer information in order to be able to automatically store maintenance operations, inspections and tests which have been successfully carried out, but nevertheless to also be able to automatically transmit information which is not relevant to the test but is possibly required to the customer.

Claims

1. Method for maintaining equipment in large-scale technical installations or production facilities, comprising the following steps of:
 - a) providing a data processing system in which equipment comprising a multiplicity of individual equipment units is recorded in equipment data records and from which the current maintenance, inspection or test status of the recorded equipment units can be retrieved,
 - b) using the data processing system to generate at least one digital or non-digital template which relates to a pending maintenance measure and has an equipment identifier which uniquely identifies a particular equipment unit and can be automatically evaluated by the data processing system,
 - c) carrying out the maintenance measure on the equipment unit identified by the template generated,
 - d) marking the template with a result code which characterizes the result of the maintenance measure carried out and can be automatically evaluated by the data processing system,
 - e) transmitting the digital template marked with the result code or an electronic image of the non-digital template marked with the result code to the data processing system, the data processing system automatically adapting the retrievable current maintenance, inspection or test status using the equipment identifier and the result code for the affected equipment unit.
2. Method according to the preceding claim, characterized in that the data processing system automatically assigns the digital template or the electronic image of the non-digital template to the equipment data record associated with the equipment unit and stores it in a retrievable manner in a memory of the data processing system.
3. Method according to Claim 2, characterized in that the data processing system stores the digital template or the electronic image of the non-digital template, including an electronic image of a non-digital attachment of external origin, in the memory of the data processing system.
4. Method according to Claim 2 or 3, characterized in that the data processing system stores the digital template or the image of the non-digital template in a change-proof manner.
5. Method according to one of the preceding claims, characterized in that the data processing system uses program-related means to automatically allocate a file name for the template to be stored in the memory, at least part of the file name being created on the basis of the equipment identifier.

- 5 6. Method according to one of the preceding claims, characterized in that, after carrying out a maintenance measure on an equipment unit which resulted in a negative result, the data processing system uses program-related means to automatically generate a message containing the template provided with the result code and transmits this message to a station responsible for the equipment unit.
- 10 7. Method according to one of the preceding claims, characterized in that, after carrying out a maintenance measure on an equipment unit which resulted in a negative result, the data processing system generates a message containing a repair proposal and/or cost proposal, transmits this message to a station responsible for the equipment unit and, after the repair proposal or cost proposal has been approved by the responsible station, initiates the measures needed to repair the equipment according to the repair proposal and/or cost proposal.
- 15 8. Method according to one of the preceding claims, characterized in that at least some of the maintained equipment units are not able to self-diagnose their current maintenance, inspection and test status.
- 20 9. Method according to one of the preceding claims, characterized in that the data processing system independently uses program-related means to generate a calendar overview of the pending maintenance measures.
- 25 10. Method according to one of the preceding claims, characterized in that the data processing system is provided with an interface for recording equipment units which have hitherto not been recorded and/or for deleting equipment units which have already been recorded.
11. Method according to one of the preceding claims, characterized in that the digital or non-digital template relating to the pending maintenance measure is generated with the inclusion of a performance description of the maintenance measure and/or the definition of test boundary conditions and/or test details of the maintenance measure.
- 30 12. Method according to one of the preceding claims, comprising a check step during which an overview of the maintenance measures which have been carried out and open maintenance measures is displayed from the data processing system.
13. Method according to one of the preceding claims, comprising a check step during which the current maintenance, inspection and test status of the maintained equipment units is displayed.
14. Method according to Claim 13, characterized in that the current maintenance, inspection and test status of the maintained equipment units is displayed using a colour pattern, the colours of

which are assigned to the result codes of the maintenance measures which have been carried out or the pending maintenance measures.

- 5 15. Method according to Claim 13 or 14, characterized in that the current maintenance, inspection and test status of the maintained equipment units is displayed in a grouped manner, in particular according to their affiliation to particular equipment.
16. Method according to one of the preceding claims, characterized in that the data processing system is provided in such a manner that it grants different access rights to the equipment data records to different groups of people.
- 10 17. Method according to one of the preceding claims, characterized in that a plurality of templates relating to a group of pending maintenance measures are generated, and in that, after the maintenance measures included in the group have been carried out, the individual result codes of the maintenance measures are transmitted to the data processing system in collected form.
- 15 18. Computer system for maintaining equipment in large-scale technical installations or production facilities, having a data processing system in which equipment comprising a multiplicity of individual equipment units is recorded in equipment data records and from which the current maintenance, inspection or test status of the recorded equipment units can be retrieved, having an output device for generating digital and/or non-digital templates, having a recording device for reading in digital templates marked with result codes and/or electronic images of
20 non-digital templates marked with result codes, and having transmitting means for forwarding the result codes read in via the recording device to the data processing system, characterized in that the computer system is set up to carry out a method according to one of Claims 1 to 17 by means of a computer program.
- 25 19. Use of a computer system according to Claim 18 for carrying out a method according to one of Claims 1 to 17.
20. Computer program having instructions which are set up to carry out a method according to one of Claims 1 to 17.
- 30 21. Computer program product having a computer-readable medium with computer program code means, in which, after the computer program has been respectively loaded into a computer, the computer is set up to carry out a method according to one of Claims 1 to 17 by means of the program.
22. Computer program product having a computer program on an electronic signal, in which, after the computer program has been respectively loaded into a computer, the computer is set up to carry out a method according to one of Claims 1 to 17 by means of the program.

addition, the intention is to standardize the organization, handling and documentation of maintenance measures such as tests, inspections and maintenance operations.

- Another object of the invention is to provide a technical method which makes it easier for a service provider operating a large-scale technical installation on behalf of the customer and for the
- 5 customer to communicate and place orders. For external customers in particular, the use of the electronic job requirement is a prerequisite for being able to carry out or reject orders in the double-checking principle.

An electronic information system for scheduling likewise makes it possible for the customer and service provider to make resource planning of personnel and objects optimal.

- 10 An object of the invention is likewise to provide a technical method which enables standardized procedures when maintaining large-scale technical installations or production facilities and ensures easy access to the maintenance documentation.

An object of the invention is also to ensure structured storage of the results of the maintenance, inspection and test work in a form which is as automated as possible.

- 15 In addition, it is an object of the invention to provide a valid system for changing failed maintenance operations, inspections and tests to the maintenance mode and documenting the execution status of the work.

All of these objects are achieved by the present invention which includes a method for maintaining equipment in large-scale technical installations or production facilities, comprising:

- 20 a) providing a data processing system in which equipment comprising a multiplicity of individual equipment units is recorded in equipment data records and from which the current maintenance, inspection or test status of the recorded equipment units can be retrieved;
- b) generating from the data processing system a digital or non-digital template which relates to a pending maintenance measure and has an equipment identifier which uniquely identifies a
- 25 particular equipment unit and can be automatically evaluated by the data processing system;
- c) conducting the maintenance measure on the equipment unit identified by the generated digital or non-digital template;
- d) marking the template with a result code which indicates the result of the maintenance measure conducted and which is automatically evaluated by the data processing system;
- 30 e) transmitting the digital template marked with the result code or an electronic image of the non-digital template marked with the result code to the data processing system, the data processing system automatically adapting the retrievable current maintenance, inspection or

test status using the equipment identifier and the result code for the affected equipment unit.

According to this, provision is first of all made for the equipment comprising a multiplicity of individual equipment units to be recorded in equipment data records in a data processing system and for the current maintenance, inspection or test status of a particular equipment unit to be able
5 to be retrieved. The method therefore assumes that the equipment units, for which the method is intended to be used, are included in a database together with the respectively current maintenance, inspection or test status. The equipment unit and current maintenance, inspection or test status, possibly supplemented with further data, for example the current test instruction, or further detailed test information, form an equipment data record.

- 10 In the case of a pending inspection, maintenance or repair measure, a digital or non-digital template relating to the equipment unit to be inspected, maintained, tested or repaired is created via the data processing system. This template may be, in particular, an electronic form or a paper form on which the employee carrying out the measure records the activities carried out. The template has an equipment identifier which uniquely identifies a particular equipment unit and can
15 be automatically evaluated by the data processing system. This may be a numerical and/or letter code, a barcode or the like. In addition to identifying the respective equipment unit, the equipment identifier may also contain further information, for example a date relevant to the measure to be carried out and/or a part which makes it possible to subsequently assign the template to the associated equipment data records.
- 20 After the template has been generated, a relevant employee carries out the maintenance, inspection, test or repair measure specified on the template for the relevant specific equipment unit. In this case, the template defines the measure to be carried out according to criteria which have previously been uniformly stipulated for this type of equipment. This ensures that, if a multiplicity of identical equipment units of the same type of equipment are present, the procedure is also
25 standardized when the recurrent, identical measures are carried out by different employees and/or at different times.

After the measure has been carried out, the employee marks the template with a result code which characterizes the result of the measure carried out and can be automatically evaluated by the data processing system. For example, after an inspection which did not reveal any defects in the
30 equipment unit inspected, the employee will mark the template with a result code "OK". Otherwise, if defects to be eliminated have been detected, the template will be marked with a result code which reveals that there are defects, for example "Not OK". Further result codes are provided as control elements for customer information in order to be able to automatically store maintenance operations, inspections and tests which have been successfully carried out, but nevertheless to
35 also be able to automatically transmit information which is not relevant to the test but is possibly required to the customer.

CLAIMS

1. A method for maintaining equipment in large-scale technical installations or production facilities, comprising:
 - a) providing a data processing system in which equipment comprising a multiplicity of individual equipment units is recorded in equipment data records and from which the current maintenance, inspection or test status of the recorded equipment units can be retrieved;
 - b) generating from the data processing system a digital or non-digital template which relates to a pending maintenance measure and has an equipment identifier which uniquely identifies a particular equipment unit and can be automatically evaluated by the data processing system;
 - c) conducting the maintenance measure on the equipment unit identified by the generated digital or non-digital template;
 - d) marking the template with a result code which indicates the result of the maintenance measure conducted and which is automatically evaluated by the data processing system,
 - e) transmitting the digital template with the result code or an electronic image of the non-digital template with the result code to the data processing system, the data processing system automatically adapting the retrievable current maintenance, inspection or test status according to the equipment identifier and the result code for the affected equipment unit.
2. The method according to claim 1, wherein the data processing system automatically assigns the digital template or the electronic image of the non-digital template to the

equipment data record associated with the equipment unit and stores it in a retrievable manner in a memory of the data processing system.

3. The method according to claim 2, wherein the data processing system stores the digital template or the electronic image of the non-digital template, including an electronic image of a non-digital attachment of external origin, in the memory of the data processing system.

4. The method according to claim 2, wherein the data processing system stores the digital template or the image of the non-digital template in a change-proof manner.

5. The method according to claim 1, wherein the data processing system automatically allocates a file name for the template to be stored in the memory, and at least part of the file name created includes the equipment identifier.

6. The method according to claim 1, wherein when a negative result is obtained from a conducted maintenance measure on an equipment unit, the data processing system automatically generates a message containing the template provided with the result code and transmits this message to a station responsible for the equipment unit.

7. The method according to claim 1, wherein when a negative result is obtained from a conducted maintenance measure on an equipment unit, the data processing system generates a message containing a repair proposal and/or cost proposal, transmits this message to a station responsible for the equipment unit and, after the repair proposal or cost proposal has

been approved by the responsible station, the data processing system initiates the measures needed to repair the equipment according to the repair proposal and/or cost proposal.

8. The method according to claim 1, wherein at least some of the maintained equipment units are not able to self-diagnose their current maintenance, inspection and test status.

9. The method according to claim 1, wherein the data processing system independently generates a calendar overview of the pending maintenance measures.

10. The method according to claim 1, wherein the data processing system comprises an interface for recording equipment units which have previously not been recorded and/or for deleting equipment units which have been recorded.

11. The method according to claim 1, wherein the digital or non-digital template relating to the pending maintenance measure is generated with the inclusion of a performance description of the maintenance measure and/or the definition of test boundary conditions and/or test details of the maintenance measure.

12. The method according to claim 1, further comprising a check analysis during which an overview of the maintenance measures which have been conducted and open maintenance measures is displayed from the data processing system.

13. The method according to claim 1, further comprising a check analysis during which the current maintenance, inspection and test status of the maintained equipment units is displayed.

14. The method according to claim 13, wherein the current maintenance, inspection and test status of the maintained equipment units is displayed using a colour pattern, the colours of which are assigned to the result codes of the maintenance measures which have been conducted or the pending maintenance measures.

15. The method according to claim 13, wherein, the current maintenance, inspection and test status of the maintained equipment units is displayed in a grouped manner according to affiliation to a particular equipment.

16. The method according to claim 1, wherein the data processing system is structured in such a manner that it grants different access rights to the equipment data records to different groups of people.

17. The method according to claim 1, wherein a plurality of templates relating to a group of pending maintenance measures are generated, and after the maintenance measures included in the group have been conducted, the individual result codes of the maintenance measures are transmitted to the data processing system in a collected form.

18. A computer system for maintaining equipment in large-scale technical installations or production facilities according to the method of claim 1, comprising:

a data processing system in which equipment comprising a multiplicity of individual equipment units is recorded in equipment data records and from which the current maintenance, inspection or test status of the recorded equipment units can be retrieved;

an output device for generating digital and/or non-digital templates;

a recording device for reading in digital templates marked with result codes and/or electronic images of non-digital templates marked with result codes; and

transmitting capability for forwarding the result codes read in via the recording device to the data processing system.

19. A computer programmed with instructions to conduct the method according to claim 1.
20. Computer program having instructions which are set up to carry out a method according to Claim 1.
21. Computer program product having a computer-readable medium with computer program code means, in which, after the computer program has been respectively loaded into a computer, the computer is set up to carry out a method according to Claim 1 by means of the program.
22. Computer program product having a computer program on an electronic signal, in which, after the computer program has been respectively loaded into a computer, the computer is set up to carry out a method according to Claim 1 by means of the program.