CLAIMS

[Claim 1]

A maintenance work support system including a work robot configured to perform maintenance work for each work item, the maintenance work support system comprising:

a measurement unit configured to measure a measurement-target part specified for a target work item every time maintenance work for the work item is performed;

a determination unit configured to determine whether or not a measurement result measured by the measurement unit satisfies a work quality set for the work item; and

a control unit configured to, when it is determined that the work quality is not satisfied, control the work robot to perform an additional operation for the maintenance work for the work item until the determination unit determines that the work quality is satisfied.

[Claim 2]

The maintenance work support system according to claim 1,

wherein the work robot performs the maintenance work for the work item on an interior of a processing space of a substrate processing system.

[Claim 3]

The maintenance work support system according to claim 2,

wherein the work robot includes:

a first work robot positioned outside the substrate processing system and configured to perform the maintenance work for the work item; and

a second work robot positioned inside the substrate processing system and configured to perform the maintenance work for the work item.

[Claim 4]

The maintenance work support system according to claim 3,

wherein the first work robot and the second work robot include a finger mechanism including a plurality of fingers, and

the finger mechanism is configured to change an interval between the fingers depending on the work item.

[Claim 5]

The maintenance work support system according to claim 3,

wherein while substrate processing is performed in the processing space of the substrate processing system, the second work robot is stowed at a predetermined position in a conveying chamber of the substrate processing system, and

after the substrate processing in the processing space of the substrate processing system is completed and while a maintenance period continues, the

second work robot performs the maintenance work on the interior of the processing space of the substrate processing system by a part of a substrate conveying robot arm in the conveying chamber being replaced with the second work robot.

[Claim 6]

The maintenance work support system according to claim 1,

wherein a work parameter related to an operation involved in the maintenance work by the work robot is specified for each work item.

[Claim 7]

The maintenance work support system according to claim 6, further comprising:

a first training unit configured to perform re-training processing on a trained work quality prediction model using a first training data set including: the work parameter; and a measurement result measured by the measurement unit when the work robot performs the maintenance work for the work item under the work parameter.

[Claim 8]

The maintenance work support system according to claim 7, further comprising:

a first optimization unit configured to optimize the work parameter by searching for input data, in response to which a re-trained work quality

prediction model subjected to the re-training processing by the first training unit outputs an output that satisfies the work quality set for the work item; and

a first update unit configured to update the work parameter specified for the work item to the work parameter optimized by the first optimization unit.

[Claim 9]

The maintenance work support system according to claim 3,

wherein while substrate processing is performed in the processing space of the substrate processing system, the second work robot is stowed at a predetermined position in a conveying chamber of the substrate processing system, and

after the substrate processing in the processing space of the substrate processing system is completed, the second work robot performs state measurement in the processing space of the substrate processing system by a part of a substrate conveying robot arm in the conveying chamber being replaced with the second work robot.

[Claim 10]

The maintenance work support system according to claim 9,

wherein the first work robot performs the maintenance work on the processing space of the substrate processing system that is determined to need the maintenance work based on a result of the state

measurement by the second work robot among a plurality of substrate processing systems, each of which is the substrate processing system.

[Claim 11]

The maintenance work support system according to claim 10, further comprising:

a conveying robot configured to provide the first work robot with a consumable article or an end effector necessary for the maintenance work for the work item,

wherein the conveying robot provides the first work robot with a consumable article or an end effector necessary for the maintenance work for the work item that is specified for the processing space of the substrate processing system on which the first work robot performs the maintenance work among the plurality of substrate processing systems.

[Claim 12]

The maintenance work support system according to claim 11,

wherein the first work robot, the second work robot, the conveying robot, and the substrate processing system communicate with a management device.

[Claim 13]

The maintenance work support system according to claim 12,

wherein the management device is configured

to:

instruct the second work robot to perform state measurement in the substrate processing system; and

determine a maintenance schedule based on a result of the state measurement transmitted from the second work robot and indicating a state in the substrate processing system.

[Claim 14]

The maintenance work support system according to claim 12,

wherein when a maintenance work instruction is transmitted from the management device, the first work robot identifies a processing apparatus of the substrate processing system that is a target of the maintenance work, and a work item, and

when a maintenance work instruction is transmitted from the management device, the conveying robot identifies a processing apparatus of the substrate processing system that is a target of the maintenance work, and a consumable article or an end effector that is necessary for the maintenance work.

[Claim 15]

The maintenance work support system according to claim 2, further comprising:

a second training unit configured to perform re-training processing on a trained substrate quality prediction model using a second training data set including: a content of an operation specified for the

work item; and information related to a substrate quality achieved when substrate processing is performed in the processing space of the substrate processing system after the maintenance work for the work item is performed;

a second optimization unit configured to optimize the content of the operation by searching for input data, in response to which a re-trained substrate quality prediction model subjected to the re-training processing by the second training unit outputs an output that satisfies required specifications of the substrate quality; and

a second update unit configured to update the content of the operation specified for the work item with the content of the operation optimized by the second optimization unit.

[Claim 16]

The maintenance work support system according to claim 15, further comprising:

a management device communicably connected to the work robot,

wherein the second training unit, the second optimization unit, and the second update unit are implemented in the management device.

[Claim 17]

The maintenance work support system according to claim 16,

wherein the management device further includes a remote operation unit configured to:

acquire image data captured by an imaging device mounted on the work robot, and transmit the image data to a display device used by a remote monitoring person for viewing the image data; and

acquire an operation instruction for the work robot from the remote monitoring person, and transmit the operation instruction to the work robot.

[Claim 18]

The maintenance work support system according to claim 2,

wherein the maintenance work includes any of replacement of a consumable article of the substrate processing system, replacement of a unit in which a consumable article has been replaced, or cleaning of an inner wall of the processing space of the substrate processing system.

[Claim 19]

A control method for a computer of a work robot configured to perform maintenance work for each work item to perform:

a measurement step of measuring a measurement-target part specified for a target work item every time maintenance work for the work item is performed;

a determination step of determining whether or not a measurement result measured in the measurement step satisfies a work quality set for the work item; and

a control step of, when it is determined that

the work quality is not satisfied, controlling an additional operation for the maintenance work for the work item to be performed until it is determined in the determination step that the work quality is satisfied.

[Claim 20]

A control program for causing a computer of a work robot configured to perform maintenance work for each work item to execute:

a measurement step of measuring a measurement-target part specified for a target work item every time maintenance work for the work item is performed;

a determination step of determining whether or not a measurement result measured in the measurement step satisfies a work quality set for the work item; and

a control step of, when it is determined that the work quality is not satisfied, controlling an additional operation for the maintenance work for the work item to be performed until it is determined in the determination step that the work quality is satisfied.