CLAIMS

1. An operational plan optimization device executing discrete simulation processes of an operation in parallel by a plurality of simulators provided in parallel to optimize the operation, wherein the operational plan optimization device comprising:

an integrated control processing unit; and

a plurality of simulators communicably connected to and controlled integrally by the integrated control processing unit, and each of the simulators is configures as a computer that performs a partial process of the discrete simulation process,

wherein

the integrated control processing unit is configured to:

recognize a varying processable amount over time within a predetermined period of each of the simulators; the varying processable amount relating to at least one of a central processing unit (CPU) performance, a CPU operating rate, a memory capacity, and a memory operating rate of each of the simulators;

transmit a simulation request for a simulation process within an optimal processing amount within the recognized processable amount of each of the simulators to each of the simulators for parallel execution by at least two of the simulators, together with an operation state information group and a simulation condition;

receive a plurality of evaluation value groups as a simulation process result based on the operation state information group and the simulation condition from each of the simulators;

determine an operation objective evaluation value for each of the plurality of evaluation value groups based on an operation objective function; and

recognize a highest evaluation value group having a largest operation objective evaluation value among the plurality of received evaluation value groups;

wherein the integrated control processing unit receives information on the start and completion of the simulation process directly or indirectly from another integrated control processing unit of another operational plan optimization device that shares the plurality of simulators; and

wherein the integrated control processing unit stops recognizing the varying processable amount over time within the predetermined period of each of the simulators from the start to the completion of the simulation process.

2. The operational plan optimization device according to claim 1, wherein

the evaluation value group includes a degree of similarity to a present operation as an evaluation value.

3. The operational plan optimization device according to claim 1 or 2, further comprising:

an operation state information acquisition unit that acquires the operation state information, wherein

the operation state information is transmitted from the operation state information acquisition unit to the integrated control processing unit.

4. The operational plan optimization device according to any one of claims 1 to 3, wherein

the integrated control processing unit generates an individual operation instruction corresponding to the recognized highest evaluation value group and transmits the individual operation instruction to at least an operator terminal approximately on a real-time basis.

5. The operational plan optimization device according to any one of claims 1 to 4, further comprising:

a refinement control component communicably connected to the integrated control processing unit, wherein

the integrated control processing unit generates a simulation condition on the basis of the operation state information group and a refinement condition of the refinement control component.

6. The operational plan optimization device according to claim 5, wherein

a degree of refinement of the refinement condition of the refinement control component is changeable, or the refinement conditions of a plurality of degrees of refinement are set in the refinement control component.

7. The operational plan optimization device according to claim 5 or 6, wherein

the refinement control component generates the refinement condition on the basis of a setting condition and a plurality of refinement control components are provided.

8. An operational plan optimization method which uses the operational plan optimization device according to any one of claims 1 to 7, wherein

the integrated control processing unit executes the steps of:

executing a simulation process on a first operation range to recognize a highest evaluation value group of the first operation range;

executing a simulation process on a second operation range to recognize a highest evaluation value group of the second operation range; and

setting a third simulation condition including a first simulation condition corresponding to a highest evaluation value group of the first operation range and a second simulation condition corresponding to a highest evaluation value group of the second operation range, executing a simulation process on the third operation

range including the first operation range and the second operation range using the third simulation condition, and recognizing a highest evaluation value group of the third operation range.

9. An operational plan optimization method which uses the operational plan optimization device according to any one of claims 1 to 7, wherein

the integrated control processing unit executes the steps of:

transmitting a simulation request of a first simulation condition generated on the basis of a first refinement condition to each of the simulators together with an operation state information group and the first simulation condition;

receiving a plurality of first evaluation value groups as a simulation process result based on the operation state information group and the first simulation condition from each of the simulators;

recognizing a first highest evaluation value group based on a first operation objective function among the received plurality of first evaluation value groups and recognizing a distribution of the plurality of first evaluation value groups;

storing a second operation objective function input on the basis of the plurality of first evaluation value groups; and

recognizing a second highest evaluation value group based on a second operation objective function among the plurality of first evaluation value groups.

10. An operational plan optimization method which uses the operational plan optimization device according to any one of claims 1 to 7, wherein

the integrated control processing unit executes the steps of:

transmitting a simulation request of a first simulation condition generated on the basis of a first refinement condition to each of the simulators together with an operation state information group and the first simulation condition;

receiving a plurality of first evaluation value groups as a

simulation process result based on the operation state information group and the first simulation condition from each of the simulators;

recognizing a first highest evaluation value group based on a first operation objective function among the received plurality of first evaluation value groups and recognizing a distribution of the plurality of first evaluation value groups;

storing a second operation objective function input on the basis of the distribution of the plurality of first evaluation value groups;

transmitting a simulation request of a second simulation condition generated on the basis of a second refinement condition to each of the simulators together with the operation state information group and the second simulation condition;

receiving a plurality of second evaluation value groups as a simulation process result based on the operation state information group and the second simulation condition from each of the simulators; and

recognizing a second highest evaluation value group based on the second operation objective function among the received plurality of second evaluation value groups and recognizing a distribution of the plurality of second evaluation value groups.