CLAIMS

1. A method, comprising:

receiving, by a processing device, a first selection of a first fabrication process associated with a first manufacturing equipment of a first manufacturing environment;

inputting, by the processing device, the first selection into a digital replica of the first manufacturing equipment, wherein the digital replica outputs estimated physical conditions of an environment within the first manufacturing equipment during performance of manufacturing operations of the first fabrication process;

determining, by the processing device, environmental resource usage data indicative of a first environmental resource consumption of the first fabrication process run on the first manufacturing equipment based on the estimated physical conditions of the environment within the first manufacturing equipment during the first fabrication process;

determining, by the processing device and based on the environmental resource usage data, an eco-optimized process parameter window comprising values for one or more process parameters for the fabrication process that will reduce the first environmental resource consumption of the first fabrication process when run using the first manufacturing equipment, wherein the values for the one or more process parameters of the eco-optimized process parameter window are associated with an improved reduction of the environmental resource consumption with respect to values for the one or more process parameters that are outside of the eco-optimized process parameter window; and

applying, by the processing device, the values for the one or more process parameters of the eco-optimized process parameter window to the first fabrication process.

2. The method of claim 1, wherein further comprising:

providing the environmental resource usage data as input to a machine learning model; and

obtaining one or more outputs of the machine learning model, the one or more outputs indicating a modification to the fabrication process, the modification corresponding to the eco-optimized process parameter window.

3. The method of claim 2, wherein the one or more outputs further indicate a level of confidence that the modification, when applied to the fabrication process, reduces the first environmental resource consumption of the fabrication process, the method further comprising:

determining that the level of confidence for the modification satisfies a threshold condition.

4. The method of claim 1 further comprising:

determining that the first selection fails to satisfy a threshold eco-efficiency based on the environmental resource usage data; and

responsive to determining that the first selection fails to satisfy the threshold eco-efficiency, performing an optimization of the first selection, wherein performing the optimization of the first selection comprises identifying one or more modifications to the first selection that when applied result in an updated eco-efficiency that satisfies the threshold eco-efficiency.

5. The method of claim 1, wherein the environmental resource usage data comprises at least one of an energy consumption, a gas consumption, or a water consumption associated with the first manufacturing equipment to perform the manufacturing operations of the first fabrication process.

6. The method of claim 5, wherein the eco-optimized process parameter window is associated with a priority optimization of one or more of the energy consumption, the gas consumption, or the water consumption of the first manufacturing equipment to perform manufacturing operations of the first fabrication process.

7. The method of claim 1, wherein the digital replica comprises a physics based model of the first manufacturing equipment to perform the manufacturing operations of the first fabrication process.

8. The method of claim 1, further comprising:

receiving a second selection of manufacturing equipment to perform second manufacturing operations in a second fabrication process;

receiving, from one or more sensors associated with the second selection of manufacturing equipment, second sensor data associated with the second manufacturing operations;

updating the digital replica to generate an updated digital replica, wherein the updated digital replica is associated with the first and second selection of manufacturing equipment; and

obtaining, from the digital replica, one or more outputs comprising aggregate environmental resource data indicative of a environmental resource consumption of the first selection and the second selection.

9. The method of claim 1, wherein the first environmental resource consumption comprises an environmental resource consumption associated with one of a replacement procedure or an upkeep procedure of a consumable part of the first manufacturing equipment.

10. The method of claim 1, wherein the environmental resource usage data comprises life-cycle data of a component associated with the first manufacturing equipment, and wherein the eco-optimized process parameter window corresponds to corrective action associated with the component.

11. A method for training a machine learning model to identify modifications to a selection of a fabrication process associated with a manufacturing equipment to perform manufacturing operations of the fabrication process, wherein the modifications are associated with reducing an environmental resource consumption of the fabrication process, the method comprising:

generating, by a computing device, training data for the machine learning model, wherein generating the training data comprises:

identifying a first training input comprising fabrication process data, the fabrication process data indicating a first selection of a first fabrication process and physical conditions of an environment within first manufacturing equipment during performance of the first fabrication process; and

identifying a first target output for the first training input, wherein the first target output comprises an eco-optimized process parameter window comprising values for one or more process parameters for the first fabrication process that reduce a first environmental resource consumption of the first fabrication process, wherein the values for the one or more process parameters of the eco-optimized process parameter window are associated with an improved reduction of the environmental resource consumption with respect to values for the one or more process parameters that are outside of the eco-optimized process parameter window; and

providing, by the computing device, the training data to train the machine learning model on (i) a set of training inputs comprising the first training input; and (ii) a set of target outputs comprising the first target output, wherein the trained machine learning model is to receive a new selection of a new fabrication process as input and to produce a new output based on the new input, the new output indicating a new modification to the new fabrication process that, when applied, reduces a new environmental resource consumption of the new fabrication process, the modification corresponding to a new eco-optimized process parameter window.

12. The method of claim 11, wherein generating the training data further comprises: inputting the first selection into a digital replica of manufacturing equipment associated with the first fabrication process, wherein the digital replica outputs physical conditions of the first fabrication process.

13. The method of claim 11, wherein the new environmental resource consumption comprises one of an energy consumption, a gas consumption, or a water consumption associated with the new manufacturing equipment performing manufacturing operations of the new fabrication process.

14. The method of claim 11, wherein each training input in the set of training inputs is mapped to a target output in the set of target outputs.

15. A system comprising:

a memory; and

a processing device, coupled to the memory, to:

receive a first selection of a first fabrication process associated with a first manufacturing equipment of a first manufacturing environment;

input the first selection into a digital replica of the first manufacturing equipment, wherein the digital replica outputs estimated physical conditions of an environment within the first manufacturing equipment during performance of manufacturing operations of the first fabrication process;

determine environmental resource usage data indicative of a first environmental resource consumption of the first fabrication process run on the first manufacturing equipment based on the estimated physical conditions of the environment within the first manufacturing equipment during the first fabrication process;

determine, based on the environmental resource usage data, an eco-optimized process parameter window comprising values for one or more process parameters for the fabrication process that will reduce the first environmental resource consumption of the first fabrication process when run using the first manufacturing equipment, wherein the values for the one or more process parameters of the eco-optimized process parameter window are associated with an improved reduction of the environmental resource consumption with respect to values for the one or more process parameters that are outside of the eco-optimized process parameter window; and

apply the values for the one or more process parameters of the eco-optimized process parameter window to the first fabrication process.

16. The system of claim 15, wherein further comprising:

provide the environmental resource usage data as input to a machine learning model; and

obtain one or more outputs of the machine learning model, the one or more outputs indicating a modification, to the fabrication process, the modification corresponding to the eco-optimized process parameter window.

17. The system of claim 15, wherein the processing device is further to:

determine that the first selection fails to satisfy a threshold eco-efficiency based on the environmental resource usage data; and

responsive to determining that the first selection fails to satisfy the threshold eco-efficiency, perform an optimization of the first selection, wherein to perform the optimization of the first selection the processing device is to identify one or more modifications to the first selection that, when applied, result in an updated eco-efficiency that satisfies the threshold eco-efficiency.

18. The system of claim 15, wherein the environmental resource usage data comprises one of an energy consumption, a gas consumption, or a water consumption associated with the first manufacturing equipment to perform manufacturing operations of the first fabrication process.

19. The system of claim 15, wherein the digital replica comprises a physics based model of the first manufacturing equipment to perform the manufacturing operations of the first fabrication process.