CLAIMS

What is claimed is:

1. A method for operating a mobile storage module assembly of a distributed additive manufacturing system for creating pharmaceutical products, wherein:

the mobile storage module assembly comprises a storage chamber, an inlet, and an outlet, and

the method comprises:

aligning an inlet of the mobile storage module assembly with an outlet of a material supply module to receive printing material from the material supply module;

transporting, by the mobile storage module assembly, from the material supply module to a printing station; and

aligning an outlet of the mobile storage module assembly with an inlet of the printing station to transfer the printing material to the printing station for creating the pharmaceutical products.

2. The method of claim 1, wherein the method further comprises at least one of:

adjusting a position of the storage chamber based on a guide structure mated to the storage chamber;

actuating the storage chamber toward the outlet of the material supply module the inlet of the printing station;

dampening a movement of the storage chamber when the storage chamber is decoupled from a guide structure;

positioning the storage chamber to a default position in accordance with a determination that the storage chamber is not in the default position;

receiving a command to transport from the material supply module to the printing station, wherein the mobile storage module assembly transports from the material supply module to a printing station in response to receiving the command;

transporting from the printing station to a second material supply module;

transporting from the first printing station to a second printing station;

sensing a position of the storage chamber relative to the material supply module or the printing station.

3. The method of any of claims 1-2, wherein

the mobile storage module assembly aligns to the outlet of the material supply module via a guide structure of the material supply module; or

optionally the mobile storage module assembly aligns to the material supply module via an alignment structure of the material supply module; or

optionally the mobile storage module assembly aligns to the inlet of the printing station via a guide structure of the printing station; or

optionally the mobile storage module assembly aligns to the printing station via an alignment structure of the printing station; or

optionally a pressure is applied between the mobile storage module assembly and the material supply module in response to aligning the inlet of the mobile storage module assembly with the outlet of the material supply module; or

optionally the printing material is received in accordance with a determination that at least a threshold pressured is applied between the mobile storage module assembly and the material supply module; or

optionally a pressure is applied between the mobile storage module assembly and the printing station in response to aligning the outlet of the mobile storage module assembly with the inlet of the printing station or

optionally the printing material is transferred in accordance with a determination that at least a threshold pressured is applied between the mobile storage module assembly and the printing station; or

optionally the mobile storage module assembly further comprises a screw, and

the method further comprises rotating the screw while transporting from the material supply module to the printing station; or

optionally the printing material is transferred to a first storage chamber of the printing station while a second storage chamber of the printing station provides the printing material for creating the pharmaceutical products; or

optionally the mobile storage module transports from the material supply module to a printing station in accordance with a determination that a second mobile storage module is ready for receiving the printing material; or

optionally the printing material is for creating a first portion of the pharmaceutical products.

4. A method for operating a printing station for creating pharmaceutical products, wherein:

the printing station comprises:

a first printing module; and

a first measurement module;

the method comprises:

printing, with the first printing module, a first portion of the pharmaceutical products;

transporting the first portion of the pharmaceutical products from the first printing module to the first measurement module;

inspecting, with the first measurement module, the first portion of the pharmaceutical products to determine whether the first portion meet a quality threshold;

in accordance with a determination that the first portion meet the quality threshold, transporting the first portion for a subsequent process; and

in accordance with a determination that the first portion do not meet the quality threshold, forgoing transporting the first portion for the subsequent process.

5. The method of claim 4, wherein

transporting the first portion for a subsequent process comprises transporting the first portion of the pharmaceutical products from the first measurement module to the first printing module to further print the first portion; or

optionally the printing station further comprises a second printing module, and

transporting the first portion for the subsequent process comprises transporting the first portion of the pharmaceutical products from the first measurement module to the second printing module; or

optionally transporting the first portion of the pharmaceutical products from the first measurement module to a second printing station.

6. The method of any of claims 4-5, wherein:

the printing station further comprises a second printing module, and

the method further comprises printing, with the second printing module, second portion of the pharmaceutical products; or

optionally the first portion and the second portion of the pharmaceutical products comprise a same material or comprise different material.

7. The method of claims 4-6, wherein:

the first portion of the pharmaceutical products are transported to the second printing station via a conveyor; or

optionally the printing station further comprises:

a second printing module; and

a second measurement module; or

optionally the printing station comprises a turntable, and

the first portion of the pharmaceutical products is transported via the turntable; or

optionally inspecting, with the first measurement module, the first portion of the pharmaceutical products comprises using a line laser; or

optionally in accordance with a determination that the first portion do not meet the quality threshold, discarding the first portion of pharmaceutical products; or

optionally the first portion comprises one or more layers of a first printing material.

8. A system for printing and processing a plurality of pharmaceutical products, the system comprising:

a supply station configured to:

receive material for printing the plurality of pharmaceutical products, and

provide an intermediate material for printing the plurality of pharmaceutical products;

a printing station configured to deposit the plurality of pharmaceutical products on a plate via additive manufacturing using the intermediate material; and

a packing station configured to:

receive the plurality of pharmaceutical products from the plate, and

process the plurality of pharmaceutical products.

9. The system of claim 8, further comprising

a second supply station, wherein the first supply station is associated with a first portion of the plurality of pharmaceutical products, and the second supply station is associated with a second portion of the plurality of pharmaceutical products; or

optionally one or more automated guided vehicles (AGVs) configured to transport the plate from the printing station to the packing station; or

optionally one or more AGVs configured to transport the intermediate material from the supply station to the printing station; or

optionally a second printing station, wherein the first printing station is associated with a first portion of the plurality of pharmaceutical products, and the second printing station is associated with a second portion of the plurality of pharmaceutical products; or

optionally a conveyor belt for transporting the deposited plurality of pharmaceutical products; or

optionally one or more AGVs configured to transport empty plates from the packing station; or

optionally a robot configured to move the plate to one or more AGVs; or

optionally a robot configured to move the plate to a drop-off location associated with the printing station.

10. The system of claim 8 or 9, wherein

the supply station comprises a loss in weight feeder configured to receive the material for printing the plurality of pharmaceutical products; or

optionally the supply station comprises one or more screws for creating the intermediate material for printing the plurality of pharmaceutical products from the received material; or

optionally the intermediate material is stored in an intermediate material box; or

optionally the supply station comprises a distribution plate for distributing the intermediate material, and the distribution plate comprises one or more channels; or

optionally the one or more channels of the distribution plate correspond to one or more tubes of an intermediate material box for storing the intermediate material; or

optionally the supply station further comprises a robot configured to move an intermediate material box for storing the intermediate material; or

optionally the robot is configured to move the intermediate material box to a storage locker for storing the intermediate material box; or

optionally the robot is configured to move the intermediate material box to an automated guided vehicle (AGV); or

optionally the supply station comprises a storage locker for storing the intermediate material; or

optionally the intermediate material is stored in one or more intermediate material boxes transported by the one or more AGVs; or

optionally the one or more intermediate material boxes are placed on a ring guide; or

optionally the printing station is configured to receive the intermediate material via one or more AGVs; or

optionally the printing station comprises a padding module configured to receive and transport the intermediate material to a printing module of the printing station; or

optionally the padding module is configured to align to an intermediate material box for storing and providing the intermediate material; or

optionally the printing station comprises one or more screws for extruding the intermediate material, and the extruded intermediate material is used for printing the plurality of pharmaceutical products; or

optionally the printing station comprises one or more screws for supplying the intermediate material to a printing module of the printing station; or

optionally each of the one or more screws is associated with a tube of an intermediate material box for storing the intermediate material; or

optionally the printing station is configured to:

receive the intermediate material from a first intermediate material box, and

in accordance with a determination that the first intermediate material box is empty, receive the intermediate material from a second intermediate material box; or

optionally the robot comprises one or more suction mechanisms, wherein the robot is configured to activate the one or more suction mechanisms to pick up the plate from a drop-off location and deactivate the one or more suction mechanisms to place the plate on the station; or

optionally the printing station is configured to rotate to move the plate from a first location to a second location; or

optionally the packing station comprises a plurality of weight scales configured to weight each detached pharmaceutical product of the plurality of pharmaceutical products detached from the plate, each weight scale of the plurality of weight scales configured to:

receive a respective pharmaceutical product from the detached plurality of pharmaceutical products; and

obtain a weight for the respective pharmaceutical product; or

optionally a gripper of the packing station is configured to place each pharmaceutical product of the plurality of pharmaceutical products onto a weight scale of the plurality of weight scales; or

optionally the plurality of weight scales is arranged in an array; or

optionally the packing station comprises one or more imaging devices configured to capture one or more images of the plurality of pharmaceutical products; or

optionally the packing station comprises a transfer module configured to pick up the plurality of pharmaceutical products from the plurality of weight scales, wherein the plurality of picked-up pharmaceutical products are arranged in an original formation; or

optionally the transfer module comprises an array of suction cups arranged in the original formation, each suction cup configured to engage with a pharmaceutical product of the plurality of pharmaceutical products or

optionally the transfer module is configured to discard a first subset of the plurality of pharmaceutical products while retaining a second subset of the plurality of pharmaceutical products; or

optionally the first subset is selected based on a quality check; or

optionally the quality check is at least partially based on at least one of weights and sizes of the plurality of pharmaceutical products; or

optionally discarding the first subset comprises deactivating one or more suction cups engaged with the first subset of the plurality of pharmaceutical products; or

optionally the transfer module is configured to place the second subset of the plurality of pharmaceutical products on a surface after discarding the first subset of the plurality of pharmaceutical products; or

optionally the packing station comprises a robot configured to add one or more replacement pharmaceutical products to the surface such that the added one or more replacement pharmaceutical products and the second subset of the plurality of pharmaceutical products are in the original formation; or

optionally the added one or more replacement pharmaceutical products are obtained from a first spare plate set aside by the second robot; or

optionally the second robot is configured to set aside a second spare plate based on a number of pharmaceutical products left on the first spare plate; or

optionally the added one or more replacement pharmaceutical products and the second subset of the plurality of pharmaceutical products are rearranged on the surface based on a layout of a package; or

optionally the rearrangement comprises reducing spacing between at least two pharmaceutical products on the surface; or

optionally the added one or more replacement pharmaceutical products and the second subset of the plurality of pharmaceutical products are packaged after the rearrangement.

11. A method for printing and processing a plurality of pharmaceutical products via the system of any of claims 8-10.

12. An additive manufacturing system for printing and processing a plurality of pharmaceutical products, the system comprising:

a supply station configured to:

receive material for printing the plurality of pharmaceutical products,

create an intermediate material from the received material, and

provide the intermediate material for printing the plurality of pharmaceutical products;

a printing station configured to:

receive the intermediate material,

form the plurality of pharmaceutical products on a plate via additive manufacturing using the intermediate material; and

a packing station configured to:

receive the plurality of pharmaceutical products from the plate,

discard a first subset of the plurality of pharmaceutical products while retaining a second subset of the plurality of pharmaceutical products,

replace the first subset of the plurality of pharmaceutical products with replacement pharmaceutical products, and

provide the replacement pharmaceutical products and the second subset of the plurality of pharmaceutical products for packaging.

13. A method for printing and processing a plurality of pharmaceutical products, comprising:

receiving material for printing the plurality of pharmaceutical products;

creating an intermediate material from the received material;

providing the intermediate material for printing the plurality of pharmaceutical products;

forming the plurality of pharmaceutical products on a plate via additive manufacturing using the intermediate material;

receiving the plurality of pharmaceutical products from the plate;

discarding a first subset of the plurality of pharmaceutical products while retaining a second subset of the plurality of pharmaceutical products;

replacing the first subset of the plurality of pharmaceutical products with replacement pharmaceutical products; and

providing the replacement pharmaceutical products and the second subset of the plurality of pharmaceutical products for packaging.

14. A non-transitory computer readable storage medium storing one or more programs, the one or more programs comprising instructions, which when executed by an additive manufacturing system with one or more processors and memory, cause the system to perform a method comprising steps of any of claims 1-13.