according to any one of the examples disclosed above and/or according to any one of the examples disclosed in further detail below. The surge vessel is configured for single use. The surge vessel is at least partially made of at least one rigid plastic material. The surge vessel comprises:

a. a rigid cylindrical vessel sidewall;

b. a rigid vessel bottom plate;

c. a rigid vessel top plate;

d. at least one supply pipe penetrating the rigid vessel bottom plate, wherein the supply pipe has at least one portion protruding into an interior space of the surge vessel and wherein the supply pipe further has at least one inlet connecting branch protruding from the vessel bottom plate outside the interior space for connecting a supply line to the supply pipe;

e. at least one outlet connecting branch protruding from the vessel bottom plate outside the interior space for connecting at least one dispensing line; and

f. at least one pressure control branch protruding from the vessel top plate outside the interior space for connecting at least one pressure control line.

mined amount of the liquid drug product, wherein the method may comprise exchanging the surge vessel after filling the batch of the liquid drug product into the containers and disposing of the surge vessel. Further, the time-pressure-filling system may comprise a plurality of the surge vessels, wherein the surge vessels may be used subsequently one after the other for different batches, wherein used surge vessels may be disposed of.

In the present disclosure, a use of at least one of the time-pressure-filling system and the surge vessel is disclosed. The at least one time-pressure-filling system and the at least one surge vessel are used for filling at least one of the following liquid drug product into containers: a pharmaceutical product; a steroid product; a liquid drug product for subcutaneous application; a liquid drug product for intravenous application; a high-potent liquid drug product; an aqueous protein solution, such as an antibody drug product solution.

A pressure-stable surge vessel may be realized by using the at least one rigid plastic material, for example polypropylene and/or polyethylene, to construct the surge vessel, wherein the rigid vessel sidewall may have a thickness of at least 1 mm. The rigid plastic material may be transparent and, thus, may allow for determining the filling level of the surge vessel by using the at least one optical sensor. The determination of the filling level may avoid overfilling of the surge vessel. Further, a filling level in the range of 25% to 75%, specifically 30% to 60%, may ensure a sufficient dwell time of the liquid, for example of the liquid drug product, in the surge vessel. During the dwell time, the liquid, such as the liquid drug product, may outgas the gas which is absorbed when pressure is applied to the liquid, for example the pressure applied to the liquid in the storage vessel. The outgassing of the liquid may enhance the filling accuracy of the time-pressure-filling system.

Claims

1. A time-pressure-filling system for filling at least one liquid drug product into containers, comprising:
   A. at least one storage vessel for storing the liquid drug product;
   B. at least one surge vessel, wherein the surge vessel is configured for single use, wherein the surge vessel is at least partially made of at least one rigid plastic material;
   C. at least one supply line for feeding the liquid drug product from the storage vessel into the surge vessel in a pressurized fashion;
   D. at least one pressure control line for applying a control pressure to the surge vessel;
   E. at least one dispenser for dispensing the liquid drug product into the containers;
   F. at least one dispensing line connecting the surge vessel to the dispenser;
   G. at least one pressure sensor for determining a pressure in the dispensing line; and
   H. at least one valve for controlling a flow of the liquid drug product through the dispensing line.

2. The time-pressure-filling system according to the preceding claim, wherein the time-pressure-filling system comprises at least one manifold, wherein the manifold provides one inlet port and a plurality of outlet ports, wherein the plurality of outlet ports of the manifold have a smaller diameter than the inlet port.

3. The time-pressure-filling system according to any one of the preceding claims, wherein the time-pressure-filling system comprises at least one sterile filter.

4. The time-pressure-filling system according to any one of the preceding claims, wherein the components of the time-pressure-filling system are connectable via couplings.

5. The time-pressure-filling system according to any one of the preceding claims, wherein the time-pressure-filling system is surrounded by at least one isolator, wherein the isolator provides a sterile surrounding for the time-pressure-filling system.

6. The time-pressure-filling system according to any one of the preceding claims, wherein the time-pressure-filling system further comprises at least one control unit, wherein the control unit specifically is configured for at least one of: controlling a filling level of the surge vessel; controlling the control pressure applied to the surge vessel; controlling an opening time of the valve.

7. A time-pressure-filling method for filling at least one liquid drug product into containers, comprising:
   i. providing the time-pressure-filling system according to any one of the preceding claims referring to a time-pressure-filling system;
   ii. feeding the liquid drug product from the storage vessel into the surge vessel in a pressurized fashion;
   iii. controlling the pressure in the surge vessel by applying a control pressure to the surge vessel;
   iv. determining the pressure in the dispensing line by using the pressure sensor; and
   v. dispensing predetermined amounts of the liquid drug product into the containers by controlling an opening time of the valve.

8. The method according to the preceding claim, wherein a batch of the liquid drug product is defined by a predetermined amount of the liquid drug product, wherein the method comprises exchanging the surge vessel after filling the batch of the liquid drug product into the containers and disposing of the surge vessel.

9. The method according to the preceding claim, wherein the time-pressure-filling system comprises a plurality of the surge vessels, wherein the surge vessels are used subsequently one after the other for different batches, wherein used surge vessels are disposed of.