

14

REPLENISHMENT OF LIQUID PROCESS MEDIUM

This invention relates to a method of replenishing a metal treatment liquid process medium.

In chemical and other processes which take place in a liquid medium it is frequently necessary to make additions of liquid to the process medium as the process proceeds. In many chemical processes the liquid process medium will contain substances, dissolved or dispersed therein, which it is desired either to interact or to react with some other substance and the further liquid additions which are made may contain a dissolved or dispersed substance which is necessary for the successful and/or continued operation of the process.

One such chemical process is that of treating a metal surface with substances dispersed or dissolved in a liquid medium so that the modified metal surface resulting from the treatment is, for example, more resistant to corrosion, more receptive to the application of paint or more pleasing in appearance. As the area of metal surface which is treated is increased so there is a corresponding depletion of those ingredients in the liquid medium which are necessary to treat the metal surface and it is then necessary to replenish these ingredients if satisfactory and consistent results are to be obtained. Many suggestions have been made for sensing the concentration of ingredients present in the liquid medium used in a metal treatment process and for determining the stage at which any replenishment should take place. There is an increasing trend towards automation of this type of process. However, the delivery of defined quantities

15
of a liquid replenisher containing dispersed or dissolved substances, which is vital to the success of metal treatment processes, particularly the automated processes, has frequently presented difficulties due to (1) the variation in flow rates of many metering pumps; (2) the possibility that the source of replenishment, for example a barrel of feedstock, becomes exhausted and that, without prior warning, the process medium then becomes increasingly deficient in vital ingredients; and (3) other interruptions in the supply of replenisher such as burst delivery tubing, broken joints and pump failure.

We have now found that the above-mentioned difficulties can be substantially overcome; and according to the present invention we provide

a method of replenishing a metal treatment liquid process medium, in which a need exists for replenishment, which comprises the steps -

- (a) passing two or more replenisher liquids from two or more reservoirs for the replenisher liquids towards two or more chambers for receiving and holding the liquids,
 - (b) determining defined volumes of replenisher liquids which are required to be passed into each of the chambers, these volumes being always in a defined ratio ,
 - (c) sensing whether the defined volumes of replenisher liquids are held or are not held in each of the chambers,
 - (d) indicating aurally or visually if the defined volume of each replenisher liquid is not held in the chambers when required to be delivered to the process medium,
- and
- (e) delivering the defined volumes of liquid, when held in the chambers, to the process medium in response to a signal that replenisher liquid is required.

16

It is desired to employ two or more chambers in order to keep the two or more replenisher liquids separate before addition to the process medium rather than premix them in a common reservoir, for example because they may be interactive, or because it may be desired to vary their relative proportions more frequently than the interval of time between replenishments, of a common reservoir.

The chambers will be constructed of a material which is resistant to chemical attack or dissolution by a solvent, and preferably is constructed of a material such as polyvinyl chloride.

The means for determining the defined volume of replenisher liquids in the chambers may take the form of, for example, an arrangement whereby any replenisher liquid received in a chamber which is in excess of the defined volume passes out of the chamber by an overflow conduit; or, for example, of an arrangement comprising a level-sensing means such as a float-operated mechanism which cuts off the flow of replenisher liquid when the float reaches a predetermined level. The individual means for determining the volumes of the replenisher liquids in the two or more chambers are correlated such that the volumes of the replenisher liquids supplied to the process medium are always in a definite ratio.

It is a major advantage of the process of this invention that any malfunction in the supply of replenisher liquid, for example a fault in a pump or exhaustion of a reservoir for a replenisher liquid, may be realised by a process operative before undue harm results in the process due to a lack of replenisher liquid.

The delivery of replenisher liquid from the chambers to the process medium may comprise a valve actuated, for example, by electrical, mechanical or pneumatic means in response to a signal, for example

a signal that liquid replenisher is required by the process medium.

Sensing the presence of defined volumes of replenisher liquids in the chambers and determining the defined volumes of replenisher liquids respectively, may be combined at least in part, for example where an electric circuit is completed when defined volumes of replenisher liquids have been received in the chambers, and thereby flow of replenisher liquid to the chambers is halted.

The chambers may receive a replenisher liquid directly, for example by its being pumped directly, from a reservoir such as a barrel or stock tank of replenisher liquid, or the replenisher liquid may be pumped to an intermediate station where a defined volume of the replenisher liquid may be determined.

A signal that replenisher liquids are required to be delivered to the process medium may follow a test conducted on, or a sensing of a variable characteristic of, the process medium; for example a chemical analysis for a chemical species or a sensing of a variable such as conductivity.

The sequential operation of the present process can be suitably accomplished by the aid of electromechanical or electronic means, the latter advantageously incorporating microprocessors.

The process will now be described with reference to the accompanying diagrammatic drawing.

Referring to numbered parts of the drawing, (1) represents a reservoir, for example a barrel, of replenisher liquid connected with a pump (5); (2) represents a cylindrical chamber for holding a predetermined volume of replenisher liquid (3) which is to be supplied to a process medium (7); (4) represents a means for determining the volume of replenisher liquid held in the chamber (2), for example an overflow exit from the chamber or a float-operated level determining

18

device; and (6) represents a valve, for example a solenoid-operated valve, for allowing liquid from the chamber (2) to pass to the process medium (7).

5 The parts of the drawing shown in broken-line represent a second chamber and associated components substantially the same as those just described (for example the chamber 2') whereby there is added to the process medium (7) a further defined volume of a different replenisher liquid in a proportion which is
10 related to the first defined volume of liquid such that they are in a fixed volumetric ratio.

The replenisher liquid is supplied to the chamber (2) only by operation of the pump (5) and the level of liquid in (2) is determined by a float-
15 operated device which causes ingress of replenisher liquid to cease when a desired volume of liquid is in the chamber. Alternatively there can be present an overflow conduit through which replenisher liquid leaves the chamber when a defined volume of the liquid
20 is present.

In response to a signal which indicates that replenisher liquids are required to be added to the process medium, the pump (5) supplies replenisher liquid to the chamber (2), until a desired level is
25 reached when a signal from a float-operated means (4) causes the supply to cease. A further signal then causes the valve (6) to open and replenisher liquid is supplied to the process medium (7).

In a similar manner replenisher liquid is
30 supplied to the process medium (7) from the other chamber 2' at the same time as that from chamber (2).

(19)



CLAIM

1. A method of replenishing a metal treatment liquid process medium, in which a need exists for replenishment, which comprises the steps -
 - (a) passing two or more replenisher liquids from two or more reservoirs for the replenisher liquids towards two or more chambers for receiving and holding the liquids,
 - (b) determining defined volumes of replenisher liquids which are required to be passed into each of the chambers, these volumes being always in a definite ratio.
 - (c) sensing whether the defined volumes of replenisher liquids are held or are not held in each of the chambers.
 - (d) indicating aurally or visually if the defined volume of each replenisher liquid is not held in the chambers when required to be delivered to the process medium,and
 - (e) delivering the defined volumes of liquid, when held in the chambers, to the process medium in response to a signal that replenisher liquid is required.
 2. A method according to Claim 1 and substantially as herein described.
-