



تحضير، تعبئة و تغليف، حلول هندسية
Process, Packaging, Engineering

LIQUID FILLING BY USING PERISTALTIC PUMPS IN PHARMACEUTICAL INDUSTRY.

The pharmaceutical industry is considered as one of the most demanding industries in the world. Many critical factors should be considered to guarantee a safe and reliable delivery of pharmaceutical liquids, those should be in accordance with the cGMP (Current Good Manufacturing Practices) requirements and international regulation and guide lines (FDA, EMEA, ISO).

Two important factors are: sterilization, and preventing the cross-contamination, experts - in the pharmaceutical industry - spend time and effort to be sure that these two factors are respected precisely and successfully applied. The application of CIP and SIP (in Aseptic Dept.) procedure should be built and applied carefully where the people of QA should take care in controlling, and assure the correct implementation of these 2 procedures. However, the time is another critical factor should not be forgotten in building and designing of CIP/SIP procedure.

Filling machines are one of the risky points for both: sterilization and cross-contamination, expert should take care here. All materials in contact with product should be subject to strict CIP/SIP procedure that may need many hours to be completed. So, finding a filling technology with easy and quick ability for CIP/SIP is a priority for the machine builders and designers.

In fact, the peristaltic pumping system is a very advanced solution for this dilemma, where the path of product (which is a silicone tube) is quickly removed and sent to the cleaning room, and a new set for the new product is, also, quickly installed to start the new product filling cycle. Process that may need about 5 minutes to change from product A to product B, provides a very reasonable solution for the previous three factors. Taking to consideration the other advantages that the peristaltic pump technology provides such as:

- High filling accuracy less than $\pm 0.5\%$ for very small filling volume (as small as 1mL).
- Wide filling range from 1mL to more than 2000mL.
- Anti-drip system by applying a suction pulse at the end of filling cycle.

All this advantages make the filling by using peristaltic pump is the preferable filling systems in comparison with other filling technology (like: piston and flow sensors filling systems) for Generic and Aseptic even in biomedical products and for both human and veterinary pharmaceutical industry.



Figure 1 - Overbench semi-automatic filling machine

AFAQ provides the "ACCUFILL" peristaltic filling head to be used in filling machine as an OEM version and also as overbench semiautomatic filling machine "A²F11" (see figure -1).



Figure 2 AccuFill head integrated in liquid filling machine

Besides, AFAQ using this technology as standard feature in its generic and aseptic (ophthalmic and injectable) filling machines (see figure -2).

What user has to take attention is that the filling speed is directly related to the product viscosity. Also, we recommend to use check valve if the filling nozzle ID is $\geq 8\text{mm}$ and if the surface tension of the liquid is relatively high. The following figure shows the filling speed in relation to the Filling Volume for filling nozzle with ID=5.5mm and ID=2.5mm:

