the filling system 100, such as a model of the pump 130 and/or composition of one or more of the tubings 122, 123, 124, etc. For example, the model of the pump 130 may affect the possible suck-back velocities that can be achieved by the filling system 100 during operation and affect other operating parameters of the system. Thus, it should be appreciated that the at least one additional system parameter, while not directly affecting fluid motion in the filling fluid, has an impact on the possible operating parameters that can be generated. It should be further appreciated that many different additional system parameters can be received for use in generating the at least one set of operating parameters.

[0054] As previously described, forming the bubble 411 with a stable resting profile in the filling fluid in the filling nozzle inhibits dripping of the filling fluid from the nozzle opening 221 and drying of the filling fluid within the filling nozzle 120. However, forming the bubble 411 with the stable resting profile only acts to keep a liquid plug from expanding during rest, such as when the filling system 100 is not operating. A liquid plug may still form in the filling nozzle 120 during the suck-back function due to the bubble 411 (or stable fluid interface 412) rising slightly faster than the filling fluid during the suck-back. This disparity in the rising speed of the bubble compared to the filling fluid results in some filling fluid escaping the bubble 411 and forming a film on the wall of the filling nozzle 120, which may dry and form a relatively small liquid plug.

[0055] FIG. 8 describes a method 800 for operating the filling system 100 to minimize the thickness of the film. The method 800 includes steps 701, 702, and 703 of the method 700, and in some embodiments includes steps 704 and 705, and also includes additional step 806. Step 806 includes choosing a suck-back velocity as one of the operating parameters in the at least one set of operating parameters that satisfies a Modified Taylor's Law equation of

$$\frac{h}{r}=\frac{1.34*Ca^{2/3}}{1+1.34*2.5Ca^{2/3}}$$

such that h/r is less than a predetermined maximum value where $Ca=\frac{\mu V}{\gamma}$, h/r is a thickness of a formed film within the filling nozzle 120 divided by the radius of the filling nozzle 120, μ is a viscosity of the filling fluid, V is a velocity of the filling fluid, and γ is the fluid surface tension. The predetermined maximum value of h/r can depend on the acceptable variability of the filling procedure, *e.g.*, the maximum allowed overfill or underfill of the filling fluid into a container or the minimum volume of a formed plug that clogs the filling nozzle 120. The volume of a formed plug may be calculated as an annulus volume,