OPTIMIZED PRIMING METHOD FOR THE INTELLIGEN® MINI DISPENSE SYSTEM

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Introduction

When installing a new photochemical dispense system, it is of utmost importance to properly prime the pump, fluid lines and filter before beginning routine processing operations. If the total dispense system is not properly primed, trapped air can eventually escape and create unnecessary, undesirable defectivity. An improperly primed system can never be properly recovered, so it is worth any engineer's time to properly prime the entire system to avoid headaches later.

IntelliGen® Mini Total Fluid Path

The IntelliGen Mini uses patented two-stage technology to operate filtration and dispense stages completely independently, delivering reliable and accurate dispenses and eliminating the possibility of forcing particulates through the filter as pressure increases across the filter over its lifetime.

The IntelliGen Mini also uses a pressure transducer located on the dispense pump to provide real-time filter. This filtration process can be optimized based pressure control as the fluid is pushed through the filter. This filtration process can be optimized based on filter and chemistry to provide a relatively fast and efficient priming sequence.

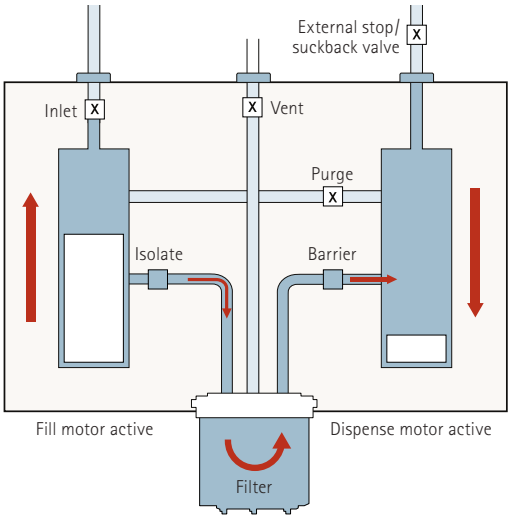

Figure 1. IntelliGen Mini fluid path during filtration

The basic fluid path during filtration is depicted in Figure 1. During the priming operation, it is most important to ensure that the entire fluid path is bubble free.

The most important place to remove bubbles is in the filter. The Impact® filter (Figure 2) consists of three areas where air must be replaced with fluid:

1. Upstream of the membrane
2. Downstream of the membrane
3. The porous area of the membrane itself

This air needs to be removed from the filter and vented out of the pump with minimal release to the outlet.

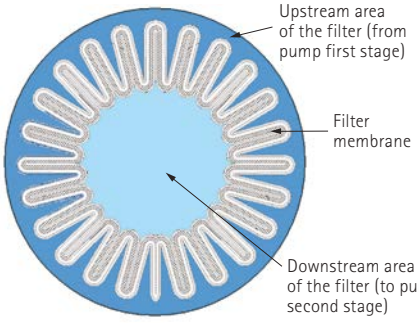

Figure 2. Simplified lateral cross-section of an Impact filter

Priming Sequence Description

Based on the previously discussed IntelliGen Mini fluid path and the Impact filter design, the best known priming sequence should include the following steps:

a. Vent: vent cycles fill the upstream part of the filter with fluid.

b. Purge to vent: purge to vent cycles begin to wet the filter membrane and remove the bulk of the air from the filter downstream of the membrane.

c. Purge to inlet: purge to inlet cycles recirculate the fluid through the filter and back to the inlet, with a small amount of vent, completing the wetting of the membrane without excessive use of chemical.

The priming sequence is comprised of different cycles that address all the areas of the pump and filter previously discussed. Each cycle is described in Table 1, and the different settings available for those cycles are described in Table 2.

TABLE 1. PRIMING CYCLE TYPE OPTIONS

	Cycle Type Options
Vent	Fill – Vent
Purge to vent	Fill – Purge to the vent port – Filtration – Vent (0.5 mL) – Purge to inlet (0.5 mL)
Purge to inlet	Fill – Purge to the inlet port – Filtration – Vent (0.5 mL) – Purge to inlet (0.5 mL)
Purge to outlet*	Dispense – Fill – Filtration – Purge (0.5 mL)
Stop	Ends the priming sequence

**Purge to outlet cannot be used with certain track configurations where the pump does not control the external stop/suckback valve. See specific operating sections of the IntelliGenMini for your type of track interface for more information.*

TABLE 2. PRIMING SETTINGS

	Setting Description	Range
Cycle type	Type of priming for that step	See "Cycle Type Options" Table 1
Cycles remaining	Number of cycles in that step	1–999
Dispense	Priming dispense rate	0.1–3.0 mL/sec
Filtration	Priming filtration rate	0.1–3.0 mL/sec
Purge	Priming purge rate	0.1–3.0 mL/sec
Vent	Priming vent rate	0.1–3.0 mL/sec
Fill	Priming fill rate	0.1–3.0 mL/sec

Setting a Priming Sequence

Setting up an initial priming sequence for the IntelliGen Mini system is a simple, one-time procedure. The priming sequence can also be loaded from or saved to an external file.

1. From the main MMI screen, select "System".

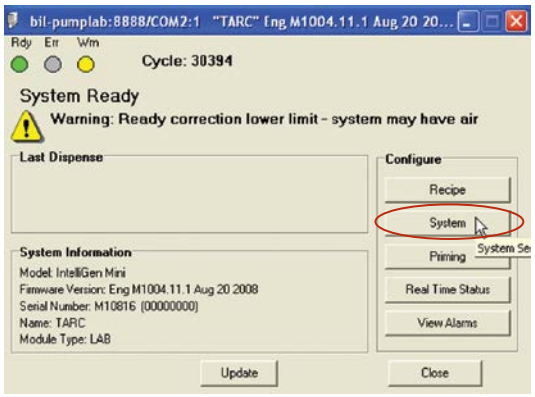

Figure 3. IntelliGen Mini Main MMI screen

2. On the System Programming screen, verify or input the following variables:

   a. Filter type

   b. Fluid viscosity

   c. Filtration pressure: refer to Table 3 for filtration pressure based on filter type.

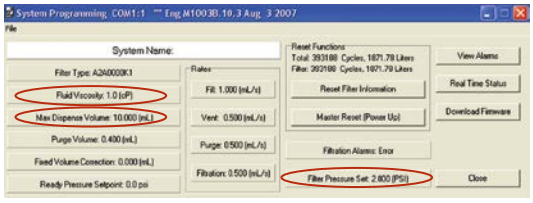

Figure 4. IntelliGen Mini MMI System Programming page

TABLE 3. RECOMMENDED PRIMING SEQUENCE VALUES

Recommendations•

		Filter Type					
	Viscosity	**Impact 2 V2 UPE**	**Impact 2 Duo**	**Impact 2 Asymmetric**	**Impact Mini 0.1 µm**	**Impact Mini 50 nm**	**Impact Mini 20 nm**
Filtration rate: (viscosity dependent)	1–10 cP	3 mL/sec	2.2 mL/sec	0.1 mL/sec	2.5 mL/sec	2 mL/sec	1 mL/sec**
	11–20 cP	2 mL/sec	–	–	–	–	–
	21–40 cP	1.5 mL/sec	–	–	–	–	–
	above 40 cP	1 mL/sec	–	–	–	–	–
Filtration pressure:		2 psi	5 psi	5 psi	1 psi	2 psi	3 psi
Fill rate:		0.5 mL/sec	0.5 mL/sec	0.1 mL/sec (beginning)	0.5 mL/sec	0.5 mL/sec	0.5 mL/sec
				0.5 mL/sec (priming)			
Vent and purge rate:		1 mL/sec	1 mL/sec	0.5 mL/sec	0.5 mL/sec	0.5 mL/sec	0.5 mL/sec

**For more information on these values, please see the Entegris Application Note, Optimized Filter Priming Method to Minimize Maintenance Downtime.*

***Impact Mini 20 nm filter is not recommended for use in chemical greater than 5 cP.*

3. After closing out of the System Programming page, select "Priming" from the main MMI screen.

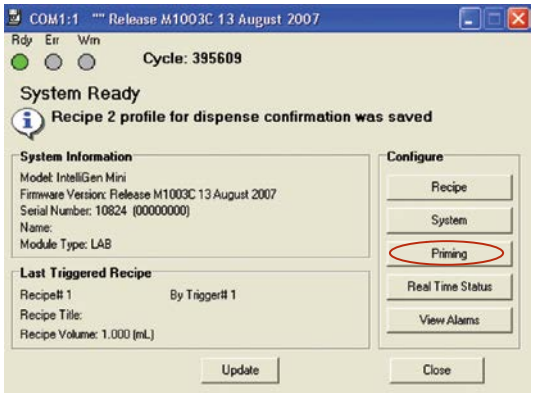

Figure 5. IntelliGen Mini Main MMI screen

4. From the Priming window, select "Priming Sequence".

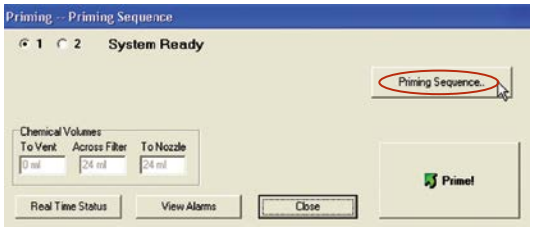

Figure 6. IntelliGen Mini Priming screen

5. In the Edit Priming Sequence window, follow the sequence based on the type of filter used (see Figure 7). There are two notes when making this priming sequence:

   a. Filtration rates are viscosity dependent. Please refer to Table 3 for values.

   b. Purge to outlet cannot be used with certain track configurations where the pump does not control the external stop/suckback valve.

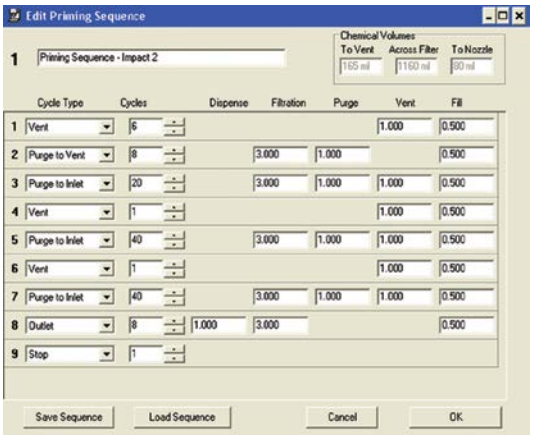

Figure 7. IntelliGen Mini recommended priming sequence with an Impact 2 filter utilizing a 1–10 cP viscosity chemistry

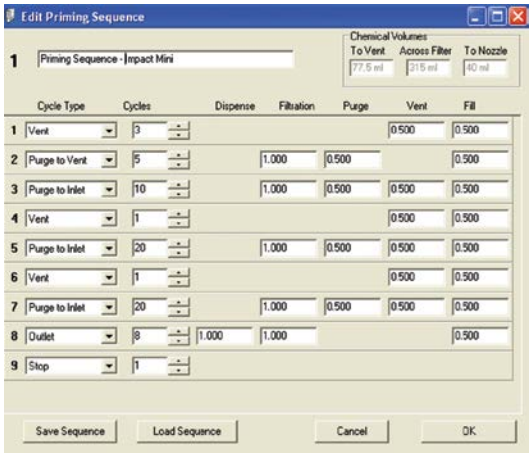

Figure 8. IntelliGen Mini recommended priming sequence with an Impact 2 Duo filter utilizing a 1–10 cP viscosity chemistry.

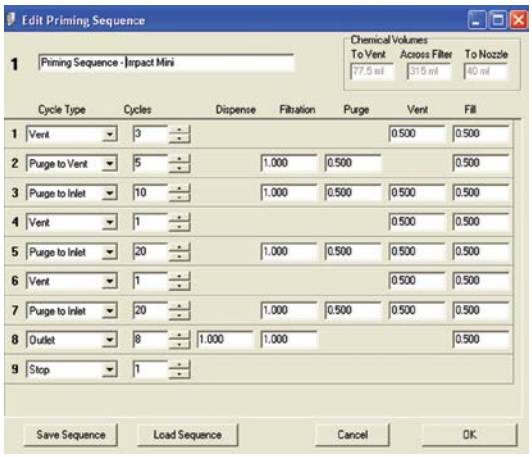

Figure 9. IntelliGen Mini recommended priming sequence with an Impact Mini 50 nm filter utilizing a 1–10 cP viscosity chemistry.

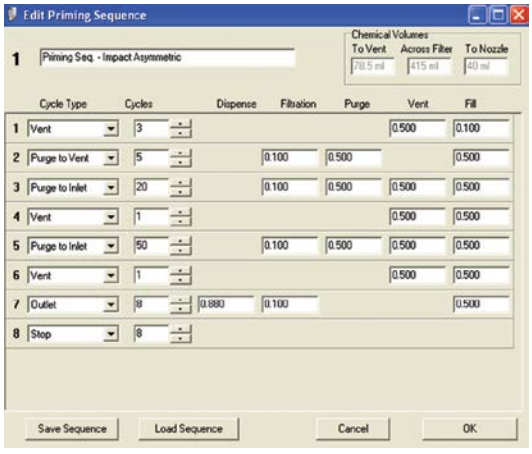

Figure 10. IntelliGen Mini recommended priming sequence with an Impact 2 V2 asymmetric filter utilizing a 1–10 cP viscosity chemistry

6. After selecting OK from the Edit Priming Sequence page, select "Prime!" from the priming window.

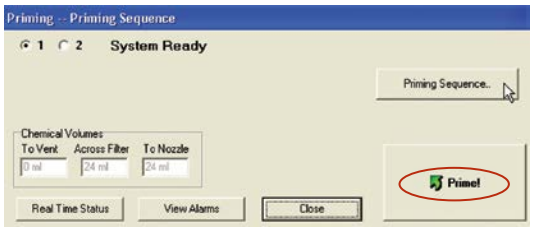

Figure 11. IntelliGen Mini Priming screen

7. After the filter priming is complete, return to the System Programming page (Figure 4) and return filtration pressure to original setting.
8. Finally, perform enough dispenses to ensure that fresh chemical from the pump is at the nozzle. Use a large volume and high dispense rate to help remove any air bubbles trapped between the pump and the nozzle.

Saving a Priming Sequence:

1. From the Edit Priming Sequence page, select "Save Sequence". Save to a local disk with a recognizable name.
2. Sequence can be saved locally and then loaded to any pump by selecting "Load Sequence" and finding the recognizable file name.

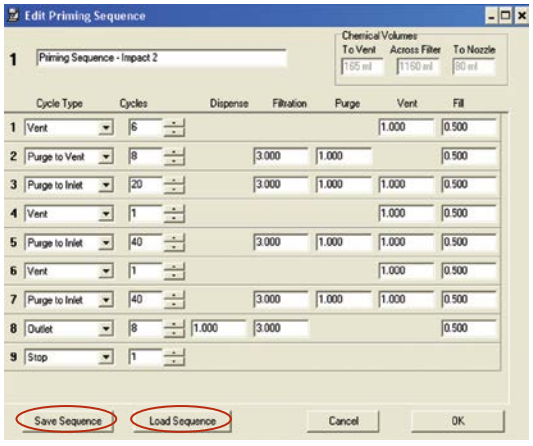

Figure 12. IntelliGen Mini Edit Priming Sequence page showing save and load sequence features

Conclusion

A properly executed priming sequence for any photochemical dispense system will ensure that normal processing operations will run smoothly.

References

1. *"Optimized Filter Priming Method to Minimize Maintenance Downtime,"* Entegris Application Note.
2. *"Impact 2 Disposable Filters,"* Entegris Application Note.
3. *"Impact 2 Duo Disposable Filters,"* Entegris Application Note.
4. "*Impact Mini Disposable Filters,"* Entegris Application Note.

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