

# Precision Slurry Dilution / Blending / Delivery System

No pumps, vacuum, or scales used

CFCs Series (2 LPM system)

## Description

ChemFlow's Point-of-Use (POU) CFCs series precision dilution / blending systems provide extremely accurate and repeatable on-site blending of slurries or chemicals over a wide range of mixing ratios. Its small footprint, only 24" wide and 20" deep, is key to the design.

ChemFlow's patented volumetric blending process, in combination with our pipe-tank design, makes precision volumetric blending and delivery simple.

The CFCs series provides 2 LPM dilution and delivery of high purity CMP chemicals to a single or multiple tools through the use of pressure vessel delivery. **It utilizes our patented adjustable "U-tube" and a 4-gallon blend tank.** Pneumatic valves and "ChemFlow ChemPulse" blender are the only moving parts employed in the system. These features provide many advantages over the competition (See Table 3).

## Theory of Operation

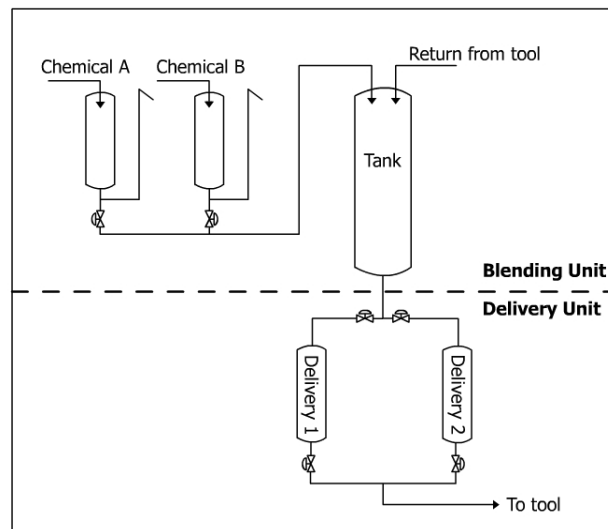
Each CFCs unit consists of two sub-units, the dilution/blending unit and the pressurized delivery unit. The blending unit accurately combines a set quantity of chemicals to achieve the desired slurry or chemical blend. The ChemFlow system mixes the slurry or chemicals together by first filling the preset measured vessels. The volume is determined by using our patented "U-Tube" technique. This allows for highly accurate repetitive volumetric measurements. Once the vessels are filled, the contents of each vessel are gravity transferred into the blending vessel. The chemicals are introduced into the 4-gallon blend vessel where the "ChemFlow ChemPulse" blender gently mixes the chemicals on entry. The result is an accurately mixed slurry or chemical. The slurry or chemical is then transferred to the delivery unit of the system by gentle gravity flow.

The delivery system transfers the slurry or chemical to the POU from one of the two vessels. From this point, it is pressurized and transferred to the POU or feedback loop under constant pressure and flow.

## Features and Benefits

There are many methods available to perform blending and delivery of slurries or chemicals. Current industry standards utilize metering pumps, scales, sensors, or a combination of the above, but these methods fail to maintain blending precision over time. The inherent problems with these methods are that they add layers of complexity to the blending and delivery processes. This translates into costly downtime due to improperly mixed batches, discarded material due to shelf-life, additional labor required for calibrations, and, or preventive/corrective maintenance.

The ChemFlow CFCs system is extremely easy to operate. It is self-monitoring and contains few moving components. The system takes advantage of the physical properties of liquids and gravity to accurately and repeatedly fill the blending vessels with precise volumes of liquid. The "U-tube" design is simple, self-cleaning. The gravity overflow drain naturally monitors the level within the vessels with precise accuracy. Once the "U-tube" is set, the volume obtained within the blending vessel is precisely repeatable.



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**Table 1: Specifications**

Model	CFCs
Applications	All Slurries
No. of Chemicals	2
Mix Rate	¼ - 2 LPM
Delivery Rate	2.5 LPM
Repeatability	+/- 0.1 % of Set-point
Real Time Analytical – Optional	Pressure, pH / ORP, Density
Pipe-tank	4 gal
Safety Certification	S2-93 Compliant
Module Dimensions	24"(W) x 20"(D) x 84"(H)

**Table 2: Facility Requirements**

Items	Connection	Pressure	Flow	Voltage	Amperage
UPW Supply	½" Flare fitting	40 psig	2 GPM	N/A	N/A
UPW Return	½" Flare fitting	40 psig	2 GPM	N/A	N/A
Nitrogen	¼" VCR Male	80-125 psig	5 SCFM	N/A	N/A
Drain	¾" FNPT	N/A	Free flowing to >3" waste	N/A	N/A
Scrubbed Exhaust	2" SCH 40 Natural Poly pipe – 2" Stub	0.5" WC	50 SCFM	N/A	N/A
Influent Chemicals Loop	Teflon PFA ½" Flare fitting	10– 20 psig	1 GPM	N/A	N/A
Influent Chemicals Dual Containment	2" SCH 40 Natural Poly pipe – 2" Stub	N/A	N/A	N/A	N/A
Primary Distribution Loop Supply and Return	Teflon PFA ½" Flare fitting	0 – 60 psig	2 GPM	N/A	N/A
Dual Containment Distribution Loop Supply and Return	2" SCH 40 Natural Poly pipe – 2" Stub	N/A	N/A	N/A	N/A
Electrical	¾" Seal-tight	N/A	N/A	120 VAC	10 amps

**Table 3: System Comparisons**

Item #	Criteria Description	ChemFlow System CFCs	Pressure / Vacuum System	Pump System
1	Precision blending relying on pumps, scales or system intrusive level sensors	No	Yes	Yes
2	Frequent blending calibration / adjustments needed	No	Yes	Yes
3	Potential CMP slurry particle agglomeration problems (i.e. tank design)	No	Yes	Yes
4	Slurry foaming problems	No	Yes	No
5	Level sensors in contact with chemical product	No	Yes	Yes
6	Air bubbles developed in delivery loop due to non-functional level sensors	No	Yes	No
7	Frequent valve cycling	No	Yes	Yes
8	Intensive preventive maintenance required	No	Yes	Yes
9	Ergonomic issues and problems	No	No	Yes