ROUSSELET ROBATEL
703 West Housatonic Street – Ste L15
Pittsfield, Massachusetts 01201-6616
manufacturing centrifuges and centrifugal extraction equipment

ROUSSELET ROBATEL MODEL BXP CENTRIFUGAL EXTRACTOR

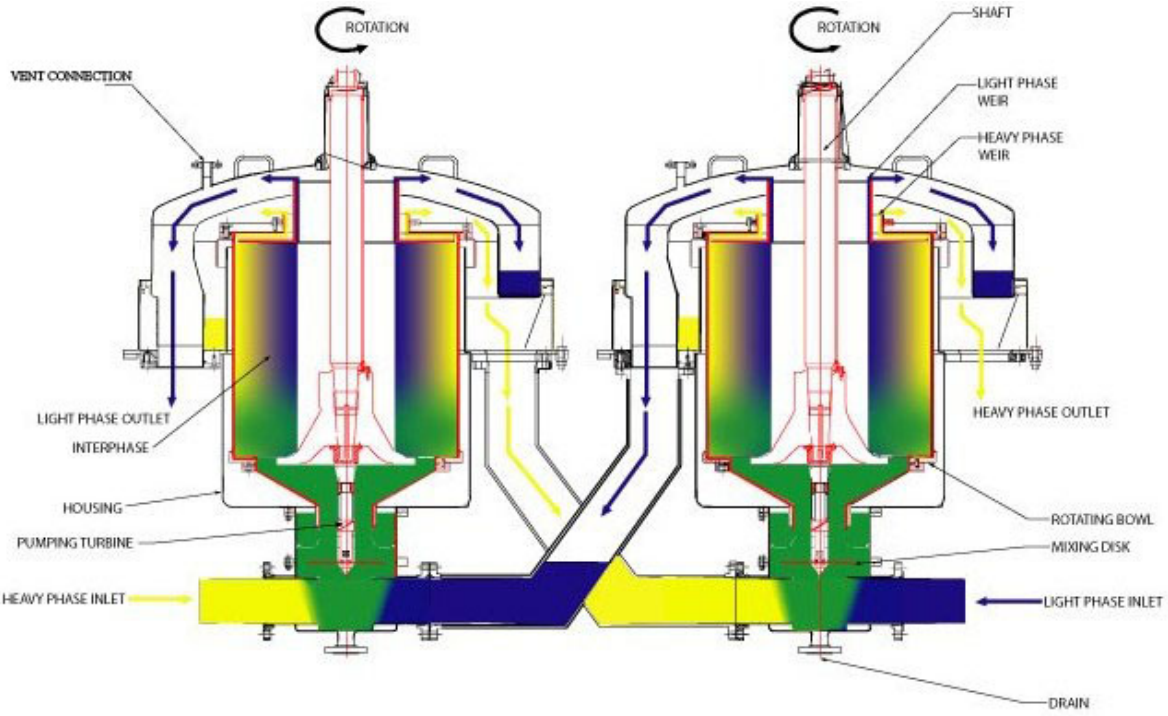

Figure 1: Two stage BXP centrifugal extractor

When operating as a centrifugal extractor for performing liquid-liquid extractions, a feed solution, containing one or more solutes (shown in yellow in Figure #1), and an immiscible solvent (shown in blue in Figure #1) with a different density than that of the feed solution are fed to the mixing chamber located on the bottom of the centrifuge housing.

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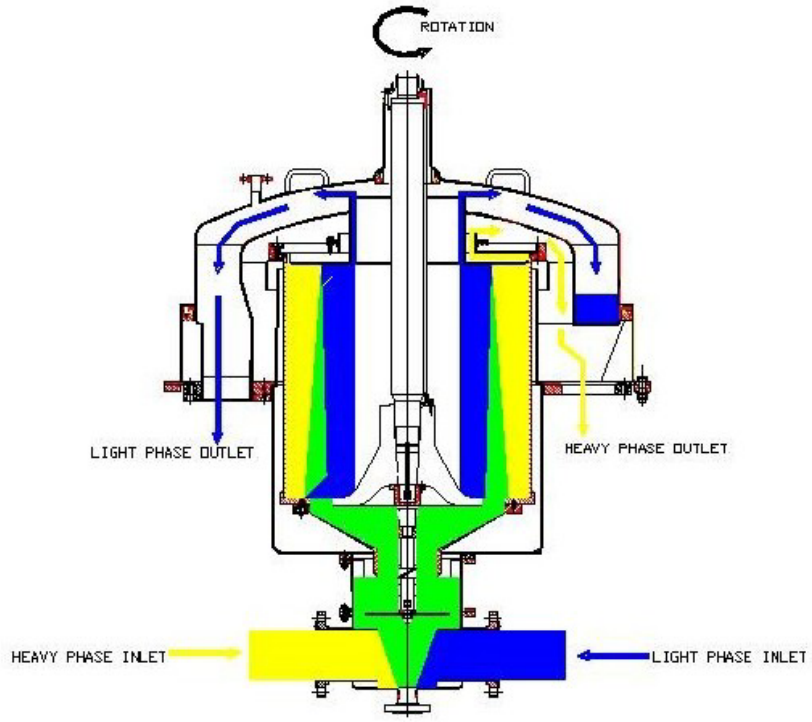

Figure 2: Single stage countercurrent centrifugal extractor

A rotating agitator disc mixes the two immiscible liquids into a dispersion (shown in green in Figures #1 & #2). Different agitator disc designs can be used depending upon the liquids' interfacial tension. The efficient mixing creates a large interfacial area between the two liquids to ensure maximum mass transfer of the solutes.

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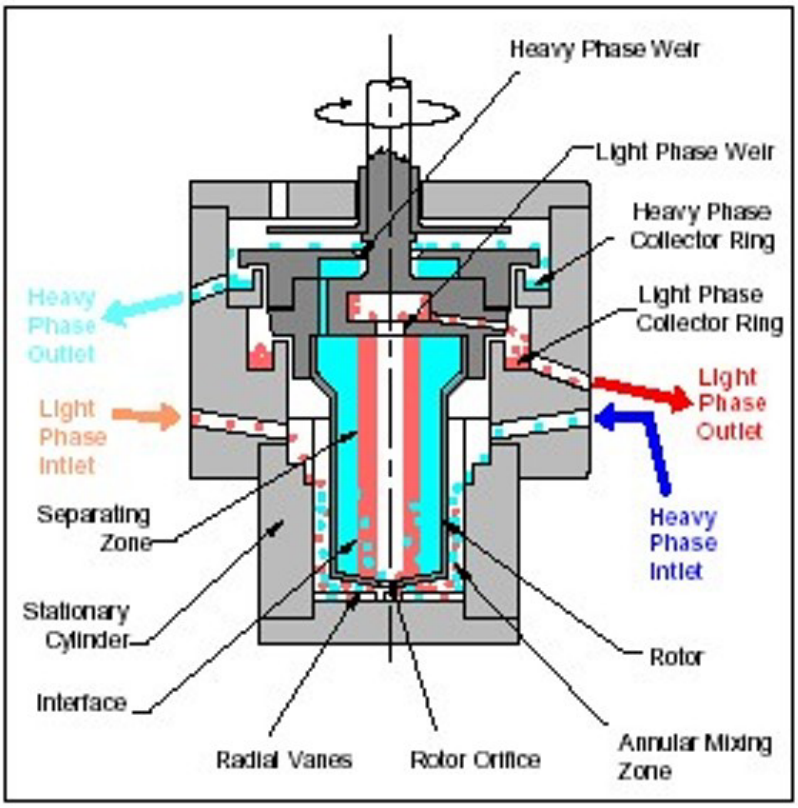

Figure 3: Annular centrifugal contactor design for low shear applications

The dispersion is aspirated into the centrifuge bowl by a turbine located on the bottom of the rotating bowl. The liquids are separated by the centrifugal force generated by the rotating bowl. The heavier liquid (shown in yellow on Figures #1 & #2) occupies the outer portion of the bowl. The light liquid (shown in blue on Figures #1 & #2) occupies the inner portion of the bowl.

We also offer annular centrifugal contactors as shown in Figure #3. The two liquids are mixed in the annular zone between the rotating bowl and the static casing. The resulting dispersion is drawn into the bowl.

The position of the liquid / liquid interphase is regulated by a heavy phase weir. Interchangeable heavy phase weirs of different diameters accommodate a wide range of density ratios. The heavy phase underflows to a static receiving chamber. The light phase overflows to a separate static receiving chamber.

The liquids are discharged by gravity to the next BXP centrifugal extractor or to downstream equipment. For multi-stage extraction processes, Rousselet Robatel Model BXP centrifugal extractors can be installed in series to provide the required number of stages. No interstage pumps are required between the extractors.

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The external interstage piping allows liquids to be fed into or routed out of the extraction process (main extraction, scrubbing, back-extraction) as required for optimum flexibility.

This makes Rousselet Robatel Model BXP monostage centrifugal extractors ideal for a closed loop solvent extraction system, as shown in Figure 4 below. One battery of BXP centrifuges is used for the main extraction, also known as the forward extraction. One BXP centrifuge is used as an extract wash [scrubbing] stage. A second battery of BXP extractors is used for the back extraction, also known as the reverse extraction.

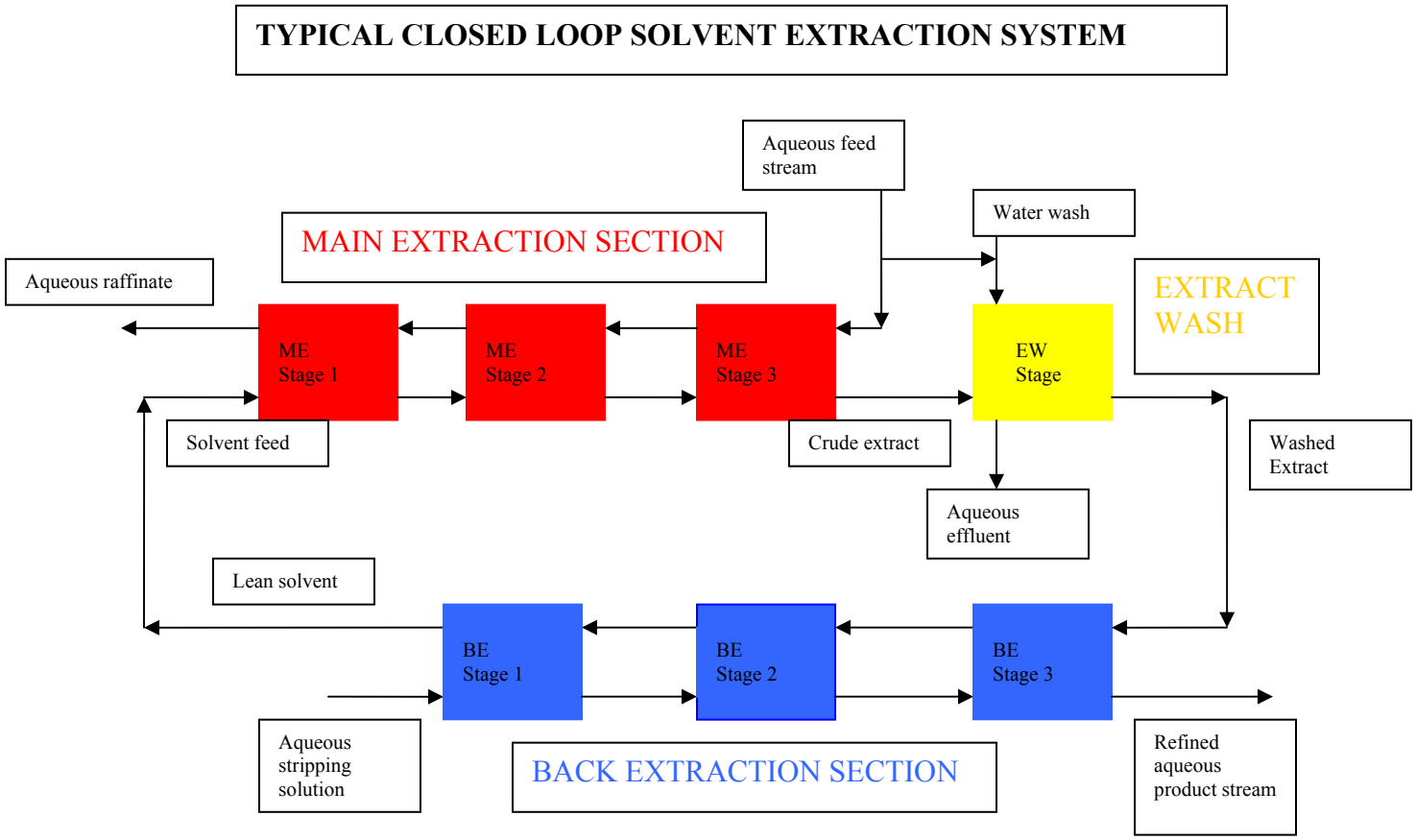

Figure 4: Diagram of a closed loop solvent system for which BXP centrifugal extractors are commonly used.

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PILOT SCALE TESTING

For any centrifugal extractor, the maximum throughputs and extraction efficiencies can only be determined by testing the technology on a laboratory and pilot scale. The performance parameters of a multistage centrifugal extractor will vary depending on the solvents used, viscosity, temperature, density ratio, surface tension, and phase flow rate ratio.

Specifically, for a centrifugal extractor, G-force and the mixing energy are important factors to consider during testing. As shown in the tables below, increased rotational speed provides a higher driving force for separation. However, as rotational speed increases, this will also increase the mixing energy imparted on the liquid / liquid system.

Therefore, the maximum rotational speed may not yield the best results. The vigorous mixing at the higher speed may create a dispersion that is more difficult to separate. Typically, there is a "bandwidth" of rotational speeds that balances the right amount of mixing with adequate G-force for effective separation. By testing at several different rotational speeds on a pilot scale, this bandwidth can be quickly evaluated.

Rousselet Robatel BXP centrifuges can be equipped with low shear pumping systems for liquid / liquid systems with low surface tension that can be emulsive. The low shear pump consists of a cone that gently aspirates the liquids into the centrifuge bowl.

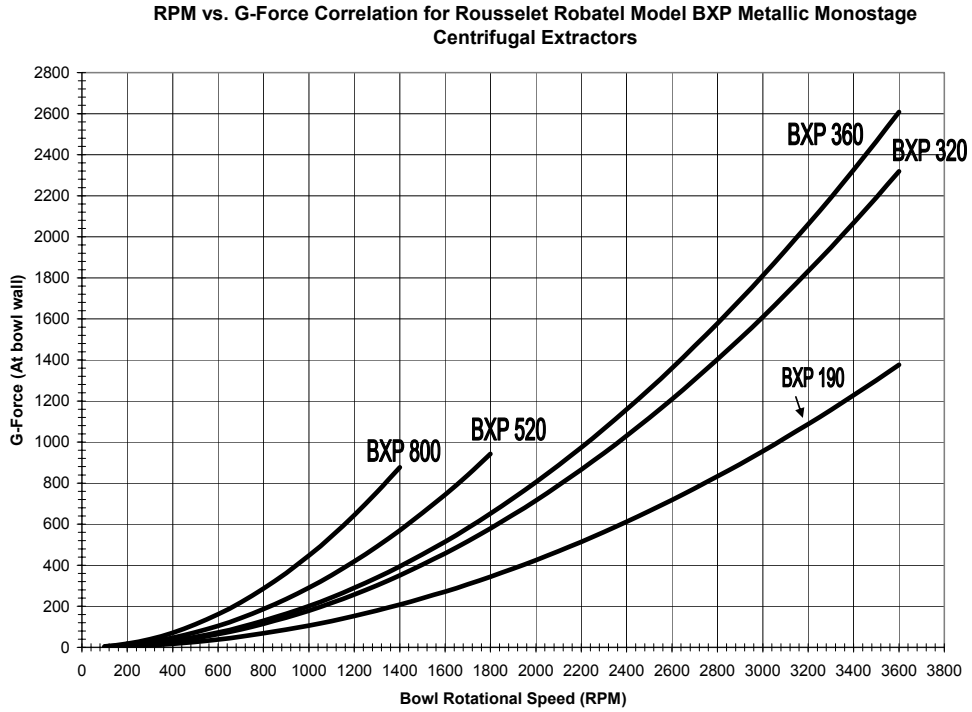

Figure 5: G-force vs. rotational speed for BXP metallic models

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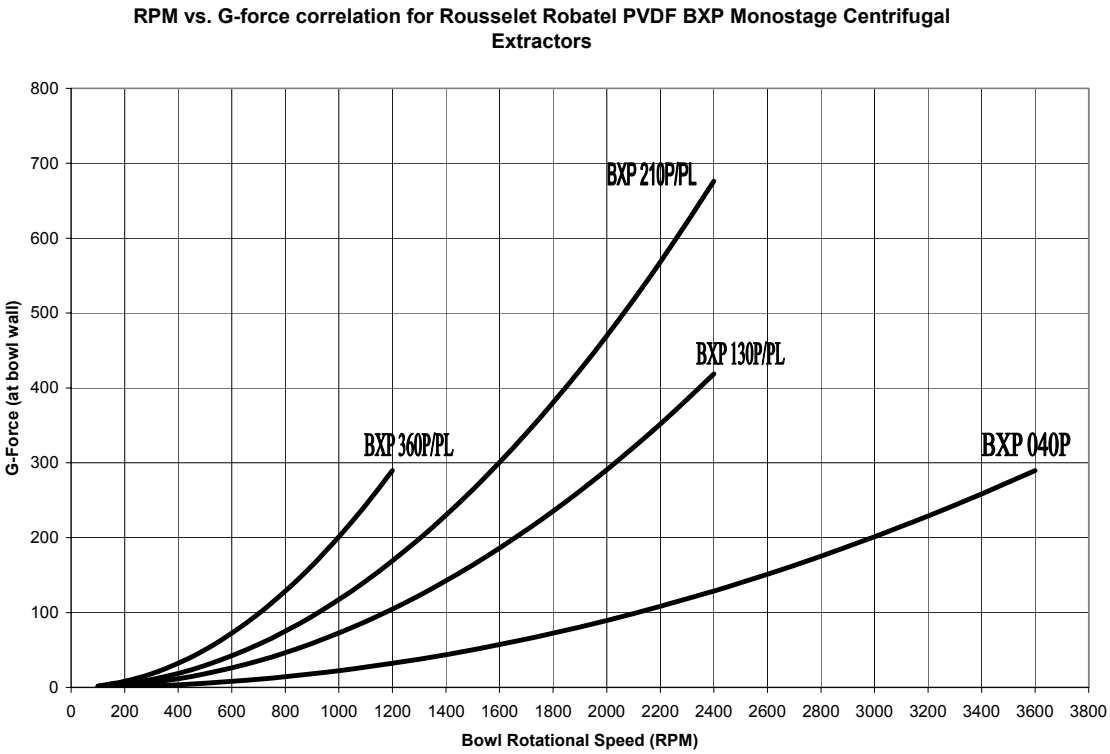

Figure 6: G-force vs. rotational speed for BXP Kynar models