

ROUSSELET ROBATEL MODEL BXP CENTRIFUGAL EXTRACTOR

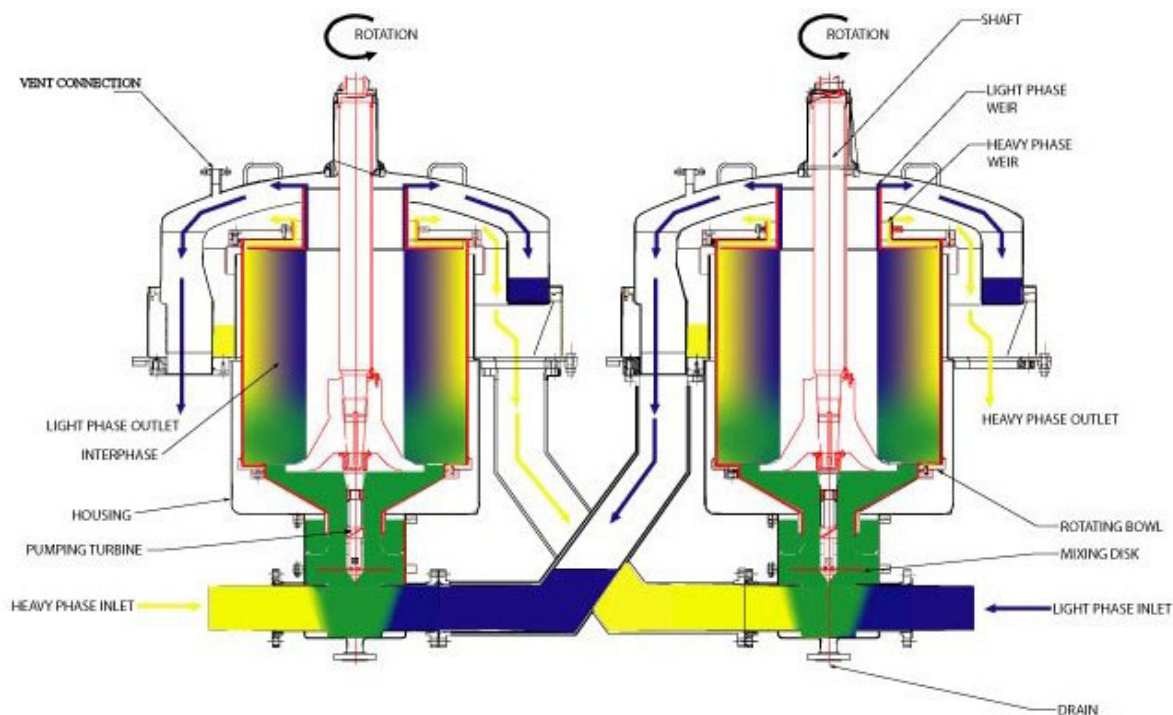


Figure 1: Two stage BXP centrifugal extractor

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.

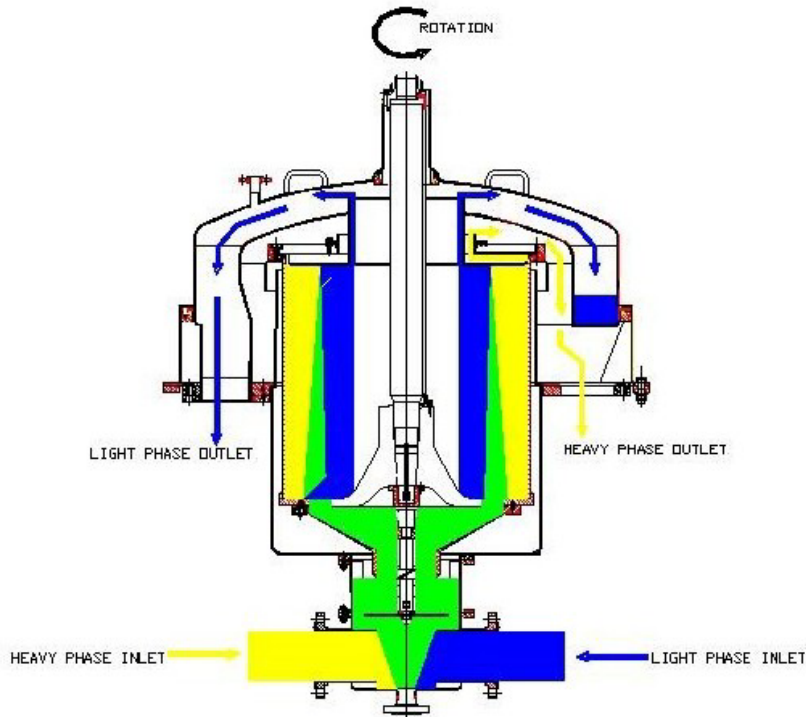


Figure 2: Single stage countercurrent centrifugal extractor

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.

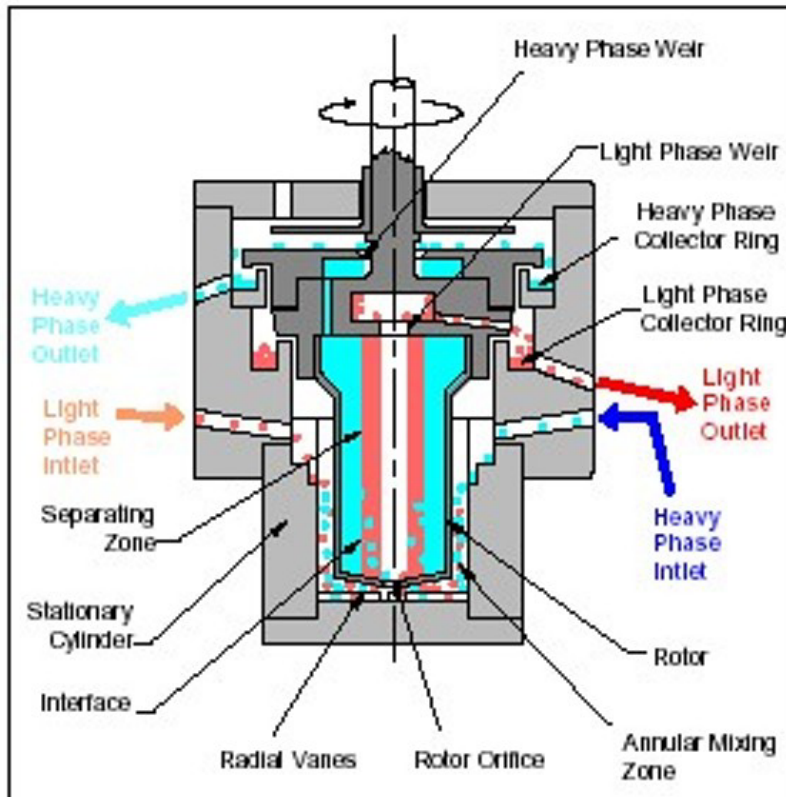


Figure 3: Annular centrifugal contactor design for low shear applications

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.

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.

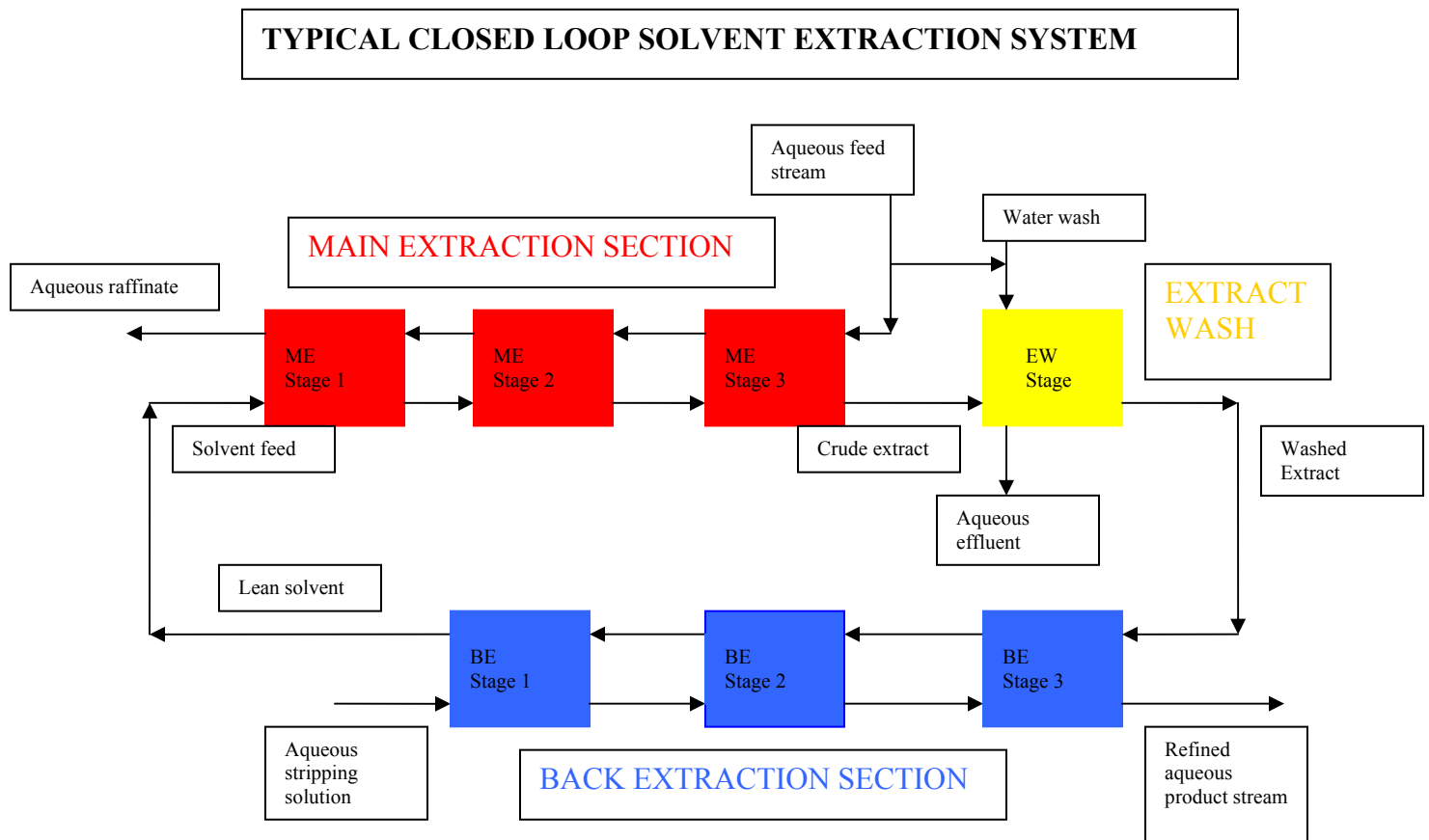


Figure 4: Diagram of a closed loop solvent system for which BXP centrifugal extractors are commonly used.

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.

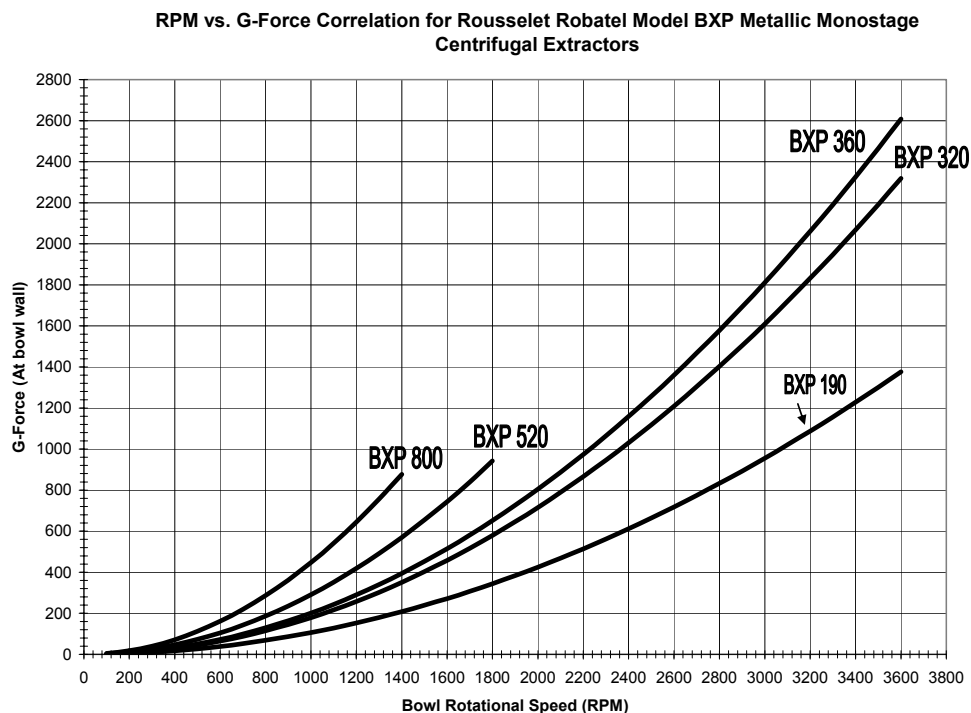


Figure 5: G-force vs. rotational speed for BXP metallic models

RPM vs. G-force correlation for Rousselet Robatel PVDF BXP Monostage Centrifugal Extractors

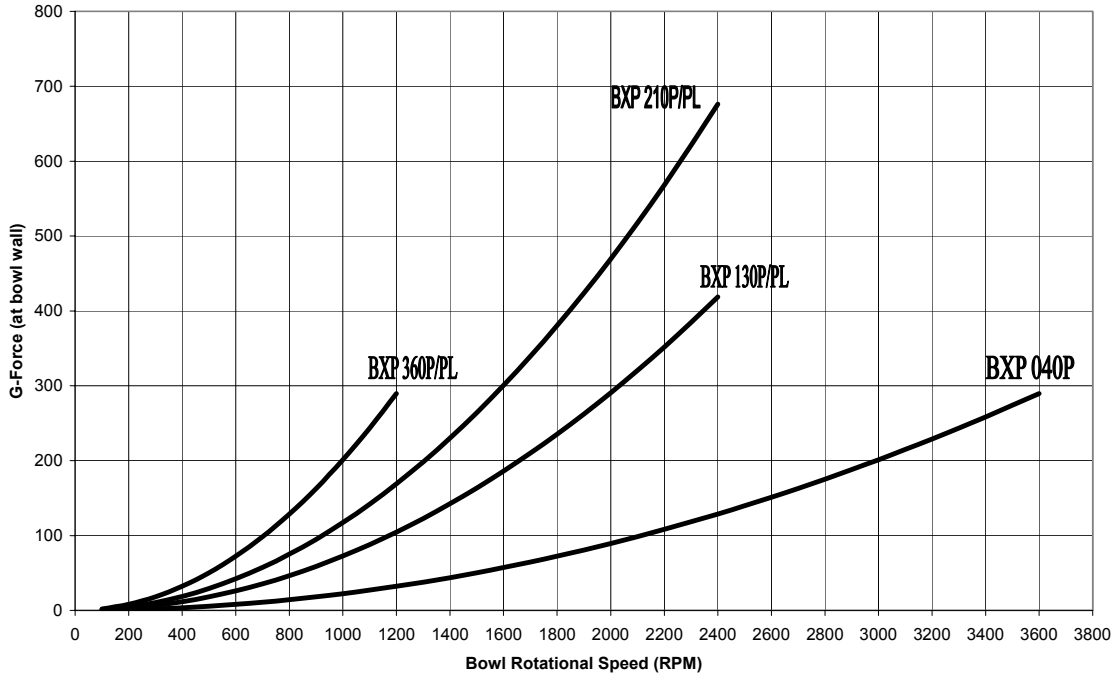


Figure 6: G-force vs. rotational speed for BXP Kynar models