

PROMIX[®] - the alternative gear spin pump

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In the PROMIX® gear spin pump, the metering, mixing, and homogenizing functions are combined in an ideal fashion.

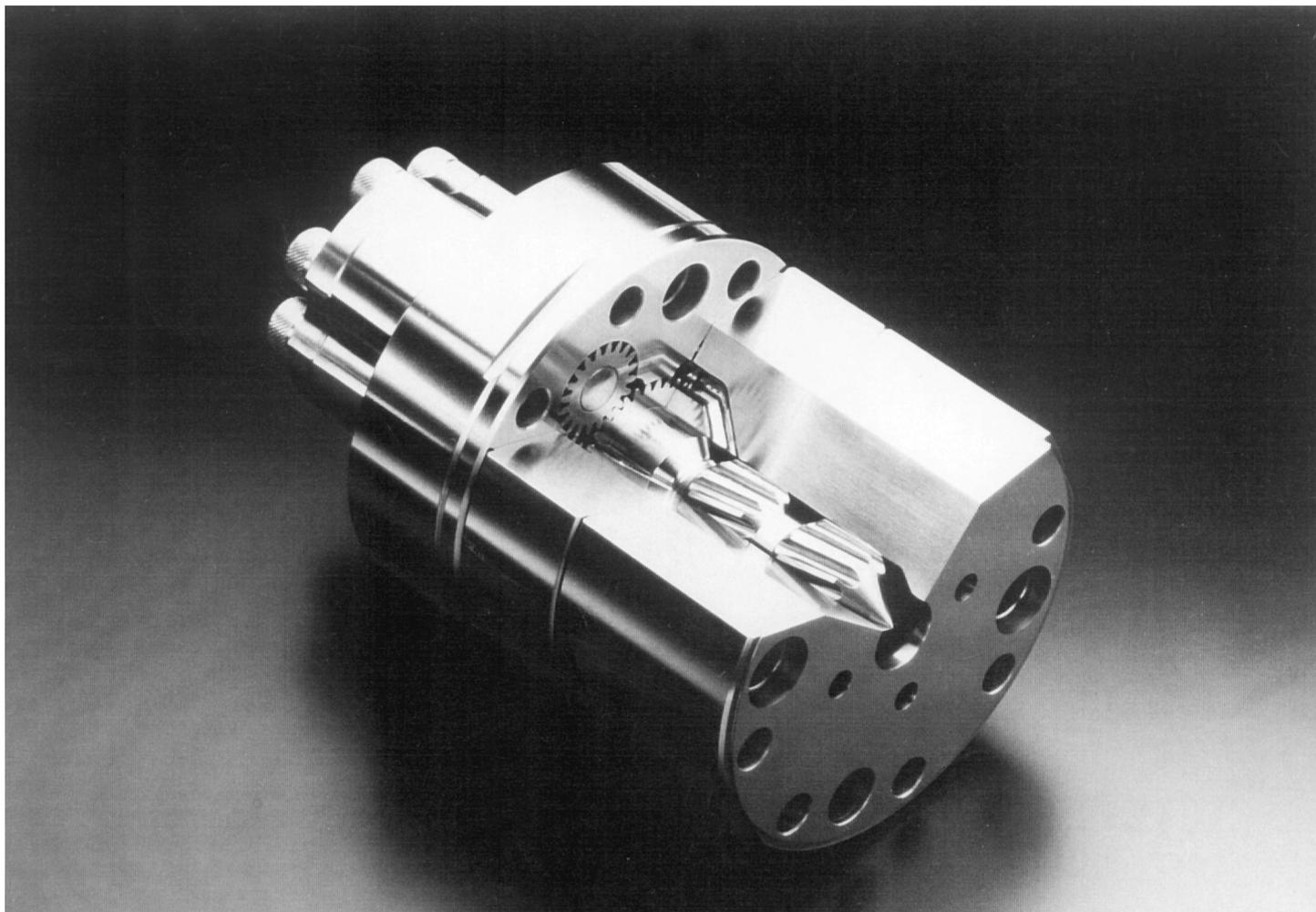
With a mixing component integrated in the pump drive shaft, the polymer melt is evened out directly at the pump inlet and subsequently fed to the individual streams (fig. 1).

More than 3500 of this patented combination of polymer mixer and precision metering pump have already been sold since it was introduced to the market, predominantly in a planetary-gear pump version. In addition to being suitable for a broad range of application, this combination also yields definite process-technological advantages and opens up new uses.

PROMIX® gear pump for melt homogenization

The PROMIX® gear pump improves the quality of the polymer melt in the spinning process. In many of today's spinning lines, static mixers are installed in the melt manifold ahead of each branch-off in order to even out differences in temperature and viscosity which occur in melt lines, depending on the flow speed. Without mixers, a thermally inhomogeneous melt stream is divided into several individual streams; as a result, the yarns produced varies in quality. The last branch-off in the melt manifold system is the inlet of the planetary gear pump, where a polymer stream is divided among 3, 4, 6, 8, or 10 individual streams.

Figure 1: PROMIX® - Melt spinning pump with mixer



If a PROMIX® planetary-gear spin pump is used, the mixer of the pump shaft protrudes into the inlet ensuring optimal melt quality in each individual stream. Differences in temperature and viscosity are minimized which, in turn, leads to greater uniformity in yarn properties as well as lower yarn break rates.

Spinning lines using PROMIX® pumps are noted for more uniform yarn properties compared to lines using conventional melt spin pumps without mixer. The variation coefficients for draw tension, tenacity, elongation, and winding tension were improved by up to 30%, depending on yarn and filament denier (fig. 2). For some applications a significant reduction of the yarn break rates could be observed, when just substi-

tuting a standard spinning pump by a PROMIX® pump (fig. 3).

If a PROMIX® pump is installed, static mixers which, in some cases, are fitted in the supply line to the pump, are dispensable. Accessibility and cleaning of the mixing part of a PROMIX® pump are considerably easier than for static mixers.

The PROMIX® pump series described above has been designed in such a way that it has the same screw connection measurements as a conventional planetary-gear spin pump and can, therefore, be retrofitted in existing spinning lines.

Figure 2: Difference in standard variation with and without PROMIX® Pump

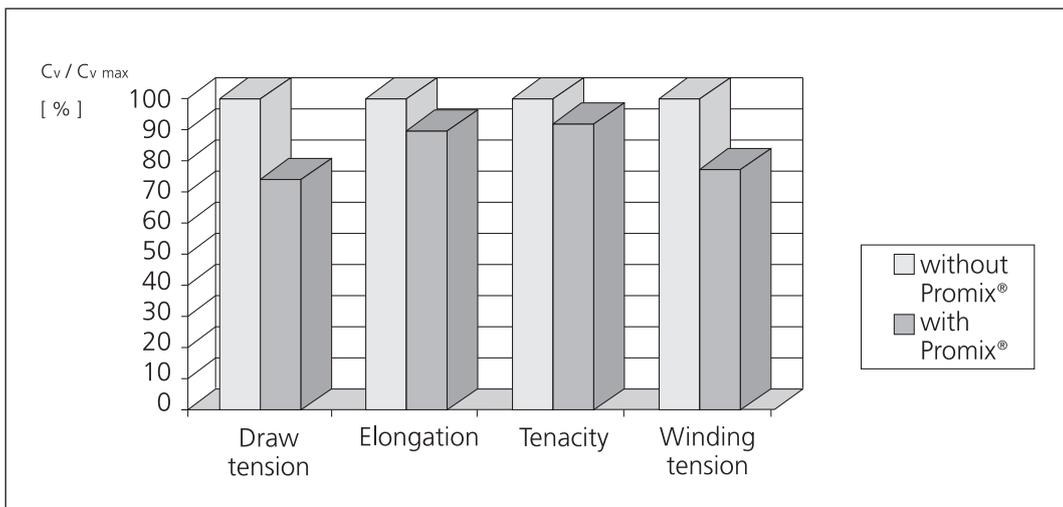
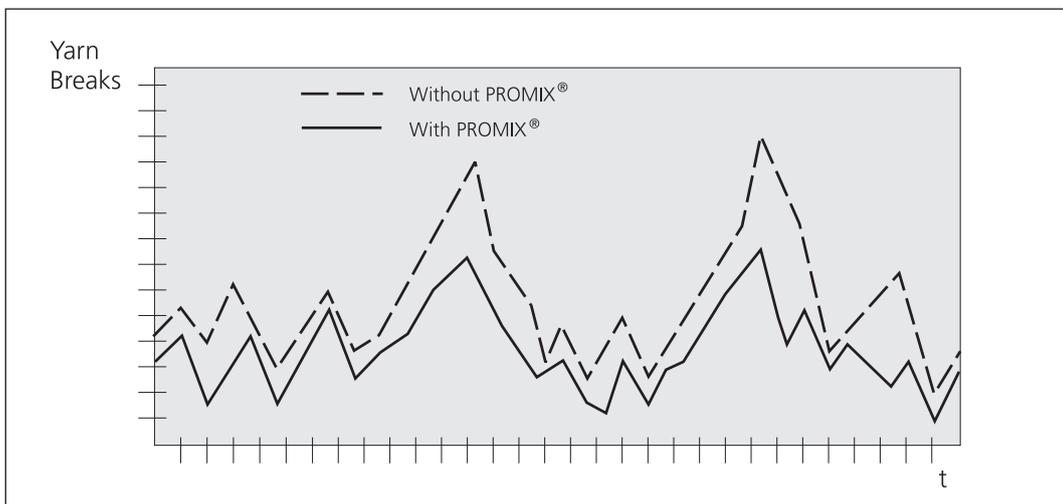


Figure 3: PROMIX® planetary gear pump - influence on yarn breaks



PROMIX®-AC for blending in of additives and colors

In addition to the aforementioned application, a modified version - the PROMIX®-AC pump - can also be used to blend additives into the spinning polymer. To this end, a pump series with specially designed mixing part was developed. By using this modified PROMIX® pump, additives, for example colors, can be metered into the spinning polymer directly ahead of the spin pump (fig. 4).

In case of production changes (for example when switching to another color), cleaning (flushing) of the melt manifold is no longer required and waste is reduced.

In spinning operations, between 0.5 and 5 weight percentages of additives are usually metered into the spinning polymer. This requires even blending of the additive stream in the spinning polymer. Until now, mixing in of the additive was usually done in a spinning extruder. The drawbacks

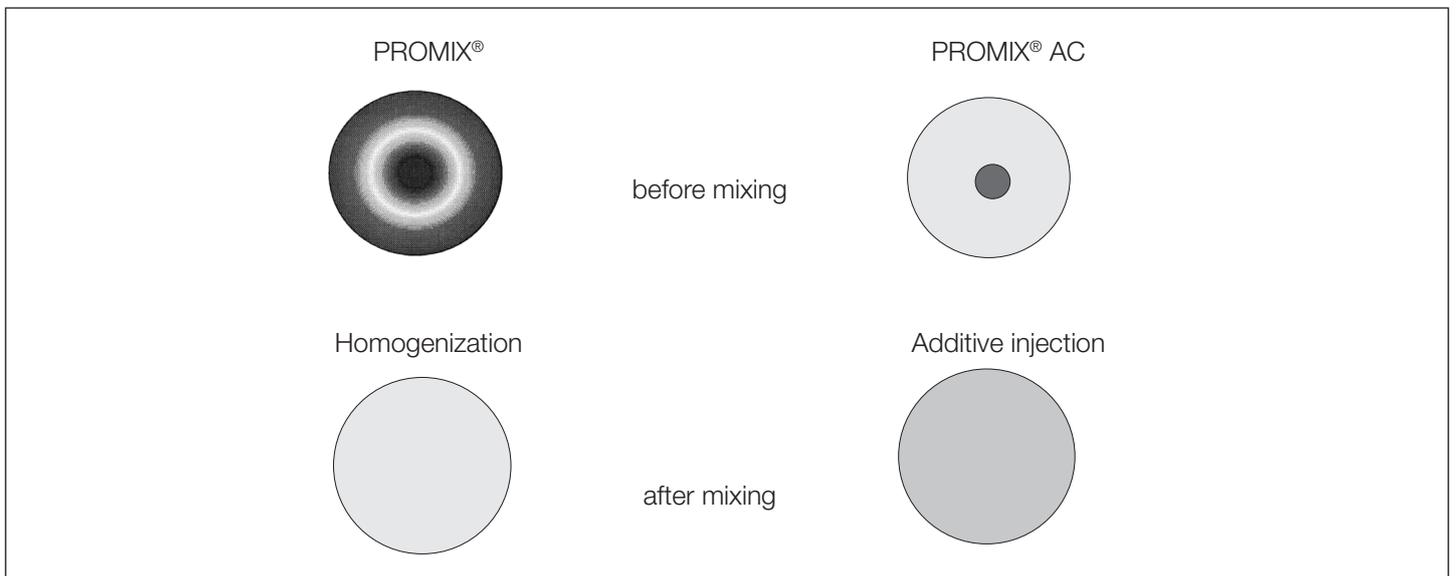


Figure 4: Application for PROMIX® pumps

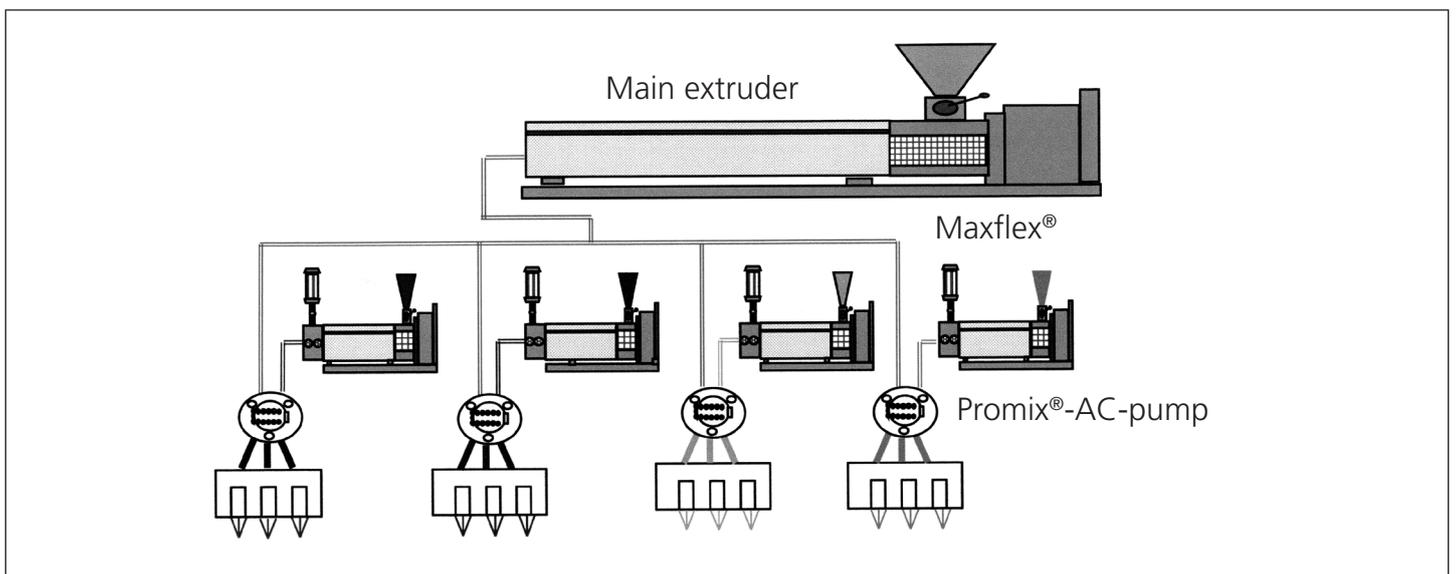


Figure 5: Additive supply by MAXFLEX® system extruder spinning

of that system are extended changeover times in case of color switches as well as insufficient flexibility to produce also smaller quantities of spun-dyed yarns. Not only does the PROMIX®-AC pump avoid these drawbacks, it even permits feeding a different additive at each spinning position for mixing with the spinning polymer in the PROMIX®-AC pump assigned to each spinning position. This requires use of suitable feed systems (side extruder or a feed system for liquids like for example the Barmag Maxflex® System). Such a system significantly increases the flexibility of the spinning line (fig. 5).

Test series feeding in colors with between 0.5 and 5 weight percentage rates have shown that by using a PROMIX®-AC pump, the resultant color dispersion is just as good as when using an extruder/dynamic mixer combination. In the extruder as well as in the pump, mixers based on the widely proven Barmag 3DD principle were used. (fig. 6).

By using this special PROMIX® pump to blend additives into the spinning polymer, the flexibility of the spinning line has been increased, opening up possibilities for economical processing of products for niche markets and other products that are needed in smaller batches.

SUMMARY

In the above, we have introduced two series of the PROMIX® gear pump that represent interesting alternatives to conventional gear pumps. Due to their special design features, these gear metering pumps can take on additional functions, such as homogenizing or mixing. This raises the quality in traditional spinning processes, while, at the same time, creating the necessary conditions for the development of new processes that require a flexible line concept.

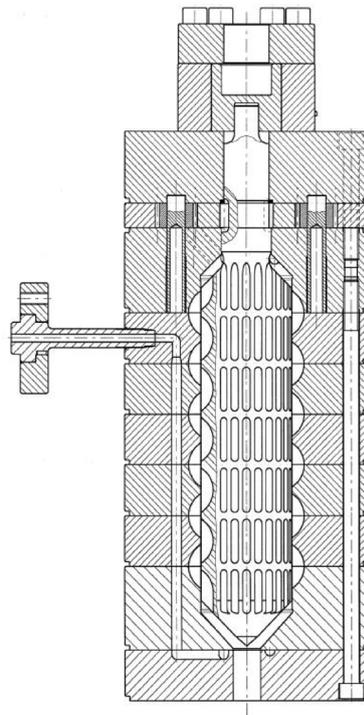


Figure 6: PROMIX® AC Melt spinning pump

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