OVERCOMING MAJOR PAPER MILL PROBLEMS ECONOMICALLY

Brazil's Pulp Industry

Nanochemistry transforms printing
Pulp's first futures market
Silicone’s applications

The materials known generically as silicones have a unique structure among pulp and tissue chemicals, with elements of both organic and inorganic chemistry. Silicones are available in several physical forms such as emulsions, concentrates, compounds and even encapsulated powders providing options to suit virtually any delivery system.

Because of their dual organic and inorganic tendencies, silicones can be manipulated in a variety of ways, and can be combined with a broad range of organic or synthetic materials. By grafting different functional groups onto the silicone backbone, it is possible to create molecular structures with properties tailored to specific applications in the pulp and tissue industry.
that yield specific characteristics. The result is a wide array of highly effective performance additives and process aids. This versatility also allows the development of customised product formulations to suit specific performance and processing criteria. Pulp and tissue formulators provide their mill customers the freedom to select a ready-to-use emulsion or a concentrate to meter into their process.

Most formulators have an image of silicone performance additives as being water repellent or hydrophobic. Silicone chemistry also offers many other variants and combinations, including hydrophilic materials, as well as products that offer a combination of properties to help achieve an optimum balance for any given application.

Specifi c performance additives deliver improvements in softness, water repellency, absorbency and temperature stability. Many products offer a number of these benefi ts, depending on the individual formulation.

Silicones offer a number of important physical characteristics for pulp washing, including excellent application, wet-out, thermal stability and broad compatibility with a wide range of other paper chemicals. For example, silicone polyethers are highly surface-active silicone materials that can be used in pulp washing formulations as effective surfactants and, as a result of their surface active nature, improve pulp drainage.

One of the most common applications for silicones involves their outstanding foam control capability. Silicone antifoams are insoluble in the foaming medium and have the ability to enter the foam lamellae and spread across them, interfering with foam stability and causing bubbles to coalesce. A wide variety of products have been developed for different process conditions in both kraft and sulfite operations, offering a broad range of options in concentration, viscosity, foam knockdown and persistency.

Typically effective at far lower concentrations than competing mineral oil-based antifoams, silicone usage levels can range from 1/3 to 1/30 of the active ingredient volume required from oil-based additives. In addition to providing foam control, silicones enhance drainage on the stock washers, which results in increased washing efficiency, reduced levels of soda loss and steam consumption, and can also reduce pulp
环保性能是乳化硅油的另一大优点

在存储、处理水乳状液等不现实的用途中，这些优势与水性乳化硅油相关合。

乳状液是悬浮液中不相溶液体的稳定混合物。可以使用市场上
的乳化液进行配制。使用聚丙烯等多聚物实现分散。硅树脂
与大部分用于控制属性与性能的成分可以兼容，这些成分包括硅树脂聚
醚、疏水硅石、有机乙二醇及其它材料。

硅树脂加工辅助15年以前在欧洲粗浆冲洗应用方面率先使用，
带来了众多下游利益。比如获得目标要求亮度等级的较低漂白化学
产品要求。此外，其环境效益也是非常重要的优点之一。它们不包
含可以检测到的双苯基氧或二苯并呋喃，而且在其使用过程中形
成有害的副产品。硅树脂在水系统中不添加生物需氧量，而且已经
证实它们在废水处理业务中十分安全。

bleaching costs via reductions in black liquor carryover to the
bleach plant. In addition, properly formulated and metered
silicone process aids are unlikely to leave residues that could
interfere with downstream paper machine operations as well
as subsequent printing or coating operations.

As digestor additives, silicones improve the penetration
of cooking liquor into wood chips during pulping, which can
result in reductions in the cooking temperature or active
alkali content while cooking. Lower cooking temperatures,
resulting in lower energy requirements combined with
reductions in active alkali can together contribute to reduced
fibre degradation, which can result in improved pulp physical
properties, particularly tear strength.

Silicone compounds are used as key ingredients in antifoam
formulations. Compounds typically consist of silicone fluids
containing a very fine dispersion of powdered silica to enhance
defoaming efficiency. For non-aqueous systems, 100 per cent
active silicone concentrates have been developed that can be
used as a key ingredient in oil-based formulations designed
for aggressive foam control requirements, such as those
encountered in chemical pulping operations.

Concentrates can be considered as combinations of silicone
compounds with other key ingredients that are formulated to
provide optimum performance in the delivery system selected by
both the chemical formulator and the pulp mill. Non-aqueous
defoamers that incorporate a silicone concentrate typically
deliver many of the performance benefits associated with
water-based silicone emulsions in applications where storage
and handling of aqueous emulsions would be impractical.

Emulsions are stable mixtures of immiscible liquids
held in suspension. They can be prepared using a number
of commercially available emulsifiers and dispersions can
be formulated using polysaccharides such as xanthan gum.
Silicones are broadly compatible with other ingredients
used to manipulate properties and performance, including
silicone polyethers, hydrophobic silica, organic glycols and
other materials.

Pioneered in Europe more than 15 years ago for
brownstock washing applications, silicone process aids bring
many downstream benefits such as lower bleaching chemical
demand to obtain target required brightness levels. Further,
their desirable environmental profile has proven to be an
important benefit. They contain no detectable dibenzodioxin
or dibenzofurans and form no harmful by-products as a result
of their use. Silicones do not add to biological oxygen demand
BOD in water systems, and they have been proven safe for
wastewater treatment operations.

In tissue converting, silicones are used to achieve a softer,
smoother feel and a reduced coefficient of friction, without
sacrificing strength. They can also be added to modify
absorbency, since silicones can be manufactured as either hydrophobic or hydrophilic formulations.

Most new products for tissue converting are emulsions, which have become the preferred delivery mechanism in finishing applications for a number of reasons, particularly ease of use. Unlike organic wax treatments that require heat melting, silicone emulsions can be applied at room temperature.

Environmental stewardship is another advantage of silicone emulsions, which are water-based and solvent-free. Although they do not biodegrade, non-volatile silicones degrade through ongoing chemical reactions in the soil, ultimately forming naturally occurring substances such as silicic acid silica, carbon dioxide and water. Silicones for pulp and tissue processing are non-toxic, and testing has shown no adverse effects on plant growth or on terrestrial life forms such as insects or birds. Researchers have found no risk to either free-swimming or sediment-dwelling organisms in the marine environment.

Some suppliers have designed a separate family of products to specifically address the processing and performance needs of tissue applications, providing a range of options in softness, feel, absorbency and strength. Some of these emulsions may allow higher levels of less expensive recycled fibres without sacrificing softness, helping to reduce overall production costs.

Dow Corning’s silicone-based products and technology are used for many applications, including pulping, coatings and recycling, with a focus on improving end product performance as well as processing, helping to lower costs and increase productivity. The firm has worked with paper chemical formulators and provided tailored technical packages that help customers meet specific needs.

Silicones can maximise process efficiency and achieve a number of benefits in a single formulated product. With their versatile chemistry, physical form and delivery system, as well as an attractive environmental profile, silicones are likely to find increasing utility in pulp, paper and tissue applications.

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道康宁，全球有机硅产品领导者，其产品广泛运用在纸浆、再生纤维、纸和纸巾以及压敏胶行业，提供远超出化学制品范围的解决方案，来帮助您达到各个阶段所需的技术创新、发展壮大和成本控制目标。


Grow your potential for paper industry success

A global leader in silicon-based technology for pulp, recycled fiber, paper and tissue manufacturing, and pressure sensitive applications, Dow Corning offers solutions that extend far beyond chemicals. We can help you achieve levels of innovation, growth and cost-control never before imagined. Learn how at www.dowcorning.com.