Omya Multifill®

Roadmap to higher mineral contents in paper
Omya Multifill®

Omya Multifill® is not simply a product but a versatile concept to optimize paper – in quality, performance and costs. Omya Multifill® helps to formulate raw materials in a cost efficient way, to optimize production processes and to gain customer recognition.

Omya Multifill® technologies enable paper producers to significantly increase filler loads. Higher filler loads reduce dependence from fiber, improve machine performance and allow substantial cost savings.

Optimize your paper in quality, performance & costs
Challenges in the Printing & Writing paper market

Producers of graphical paper face a challenging environment: A receding paper market, with an expected annual decline of approximately 3% over the coming years, resulting in overcapacities and flat sales prices. At the same time, raw material, energy and transportation costs are likely to grow. These difficulties need to be mastered without downgrading paper, print quality or runability in production, finishing and printing. Partnering with the world’s leading paper producers for decades, Omya is well aware of the graphical paper industry’s difficult market environment. Summoning their wealth of expertise and experience, our paper specialists developed and validated the Omya Multifill® concept as a sustainable solution to improve the paper producers’ productivity and profitability.
Maximizing Filler Loads

Omya Multifill® combines versatile technologies tailored to the needs of the graphical paper industry. Fiber furnish is replaced by mineral pigments, which increases filler loads without lowering productivity or paper quality. Omya Multifill® carefully bundles and structures different filler level boosting technologies to optimize the impact of each technology component. Process know-how of our technical experts, process flexibility of our GCC and PCC installations and our adaptable Omya Multifill® concept take calcium carbonate filler loading to the next level.
The first step of the Omya Multifill® concept is a comprehensive wet end survey to ensure that the actual filler type and accompanying chemistry are properly adjusted to the productive conditions and the paper grade.

**Areas of investigation:**

- Filler type
- Fineness
- Particle structure
- Refining
- Strength aids
- Retention
- Formation
- Sizing
- Others

Alternative filler grades with different pigment characteristics in terms of morphology, particle size distribution or surface area may be recommended to match customer needs. The retention systems, crucial for sheet formation, and the sizing efficiency are checked and optimized as well. Strength gaining agents are often used to allow higher filler contents but may also influence retention, formation, optical brightener efficiency and other production features. Thanks to the wide experience and process expertise of the Omya specialists, filler levels can often be increased by a few percent without any drawbacks on production process or paper quality.

The following diagrams illustrate possible strength gains through optimized strength aids, which in turn make room for filler increases. The study has been conducted with bio-polymers of different molecular weights and cationicity. This kind of fundamental change in additives requires a thorough adaption of specific production process conditions.
Surface Filling

Surface Filling (SF) technology enables paper makers to replace costly fibers with extra filler, by means of a size press, a metering size press or gate rolls. Existing starch formulations can be integrated into the concept to embed the filler in the fiber matrix.

The additional pigments do not interfere with established hydrogen bonds, responsible for strength properties; they penetrate through the surface into the sheet and thereby fill the voids between the fiber matrix. The starch applied lowers dusting and may provide extra strength in z-direction.

**Case Study:** A filler increase from 18% to 20% (applied by surface filling/replacing fiber furnish) resulted in unchanged stiffness, while paper turned out to be less porous.

Omya Surface Filling technology is successfully applied on more than 20 paper machines all over the world. A selection of cases is shown in below table.

<table>
<thead>
<tr>
<th>Country</th>
<th>PM speed m/min</th>
<th>Application</th>
<th>Paper grades</th>
<th>Extra filler %</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>1200</td>
<td>MSP</td>
<td>Copy paper</td>
<td>2</td>
</tr>
<tr>
<td>Canada</td>
<td>1200</td>
<td>Gate roll</td>
<td>High-brite mechan.</td>
<td>2</td>
</tr>
<tr>
<td>Brazil</td>
<td>700</td>
<td>SP</td>
<td>Offset</td>
<td>2</td>
</tr>
<tr>
<td>Mexico</td>
<td>1000</td>
<td>MSP</td>
<td>Uncoated w’free</td>
<td>5 - 6</td>
</tr>
<tr>
<td>Germany</td>
<td>900</td>
<td>MSP</td>
<td>Coated w’free base</td>
<td>2</td>
</tr>
<tr>
<td>Finland</td>
<td>1200</td>
<td>MSP</td>
<td>Thin printing paper</td>
<td>4</td>
</tr>
<tr>
<td>Austria</td>
<td>800</td>
<td>SP</td>
<td>Copy, offset</td>
<td>1 - 2</td>
</tr>
<tr>
<td>Spain</td>
<td>700</td>
<td>SP</td>
<td>Offset</td>
<td>2</td>
</tr>
<tr>
<td>Italy</td>
<td>1100</td>
<td>MSP</td>
<td>Offset</td>
<td>2 - 3</td>
</tr>
<tr>
<td>Thailand</td>
<td>1300</td>
<td>MSP</td>
<td>Uncoated w’free</td>
<td>2 - 3</td>
</tr>
<tr>
<td>Korea</td>
<td>800</td>
<td>MSP</td>
<td>Uncoated w’free</td>
<td>2 - 3</td>
</tr>
<tr>
<td>Taiwan</td>
<td>500</td>
<td>Gate roll</td>
<td>Printing &amp; writing</td>
<td>2</td>
</tr>
</tbody>
</table>

*SP = Size Press  MSP = Metering Size Press*

Surface Filling technology provides cost savings through fiber substitution without major paper quality impacts or runability issues. Depending on filler level, further cost savings may come from paper drying. Surface Filling additionally offers a way to control paper two-sidedness.
GCC Self-Binding

Omyaload® SB self-binding technology refers to a GCC/bio-polymer co-process. Polymers bond permanently to the calcium carbonate particles to form stable complexes that withstand shear-forces in the papermaking process. Omyaload® SB self-binding pigments are deeply embedded in the fiber matrix and firmly attached to the fiber. Moreover, hydrogen bonds are less affected than with conventional filler grades.

**Case Study:** The diagrams below illustrate a 3% filler increase with Omyaload® SB. An industrial trial confirmed that extra filler, in this case replacing bagasse, resulted in comparable paper strength and bulk characteristics.

<table>
<thead>
<tr>
<th>Tensile Index md/cd [Nm/g]</th>
<th>Bulk [cm³/g]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ref. 15%</td>
<td>Ref. 15%</td>
</tr>
<tr>
<td>Trial 20%</td>
<td>Trial 20%</td>
</tr>
<tr>
<td>30, 35, 40, 45, 50, 55, 60</td>
<td>1.25, 1.3, 1.35, 1.4, 1.45</td>
</tr>
</tbody>
</table>

Please note that various companies offer wet end polymer concepts to facilitate higher filler loads. Customer trials have shown full compatibility of standard Omya fillers with these concepts. The Omya co-processing concept, however, adheres bio-polymers to freshly cracked CaCO₃ particle surfaces. Furthermore, Omyaload® SB products are delivered ready to use and do not require additional efforts in storage, dosage and monitoring.
PCC Pre-Flocculation

Omyaload® PF Pre-Flocculation is a process step in on-site PCC production, forming conglomerates to be embedded in the fiber matrix; Omyaload® PF conglomerates have less impact on the forming of hydrogen bonds than singularized and widely scattered particles. As a result, paper strength properties are improved at identical filler levels. In addition, Omyaload® PF conglomerates – being better embedded – reduce paper dusting.

Case Study: A commercial copy paper, filled with 18% standard scalenohedric PCC was converted to pre-flocculated PCC (Omyaload® PF), raising filler loads to 21% and 23%. Although breaking length as well as bulk experienced some minor drawbacks at the 5% increase, all paper quality properties were still within specifications. Besides fiber replacement, drying energy savings and paper quality improvements promote additional profitability benefits.

More than 20 Omya on-site PCC plants are ready to adapt this pre-flocculation technology, offering our customers additional quality and cost performance benefits.
**FiberLean® MFC**

FiberLean® MFC is a composite material produced by co-grinding cellulose fibers with minerals, whereby the calcium carbonate pigments act as grinding media and make hydroxyl groups accessible. The MFC composite has a large surface area which allows the formation of more hydrogen bonds within the web and gives natural strength to the paper.

FiberLean® MFC grinding facilities are installed at paper mills and use pulp and filler already in place. The wet and dry strength characteristics of FiberLean® MFC improve paper machine runability and allow massive increases in filler loads and corresponding savings in pulp. See below mass balance illustrating a possible pulp, MFC and filler ratio.

![Micro Fibrillated Cellulose (MFC)](image)

**Micro Fibrillated Cellulose (MFC)**

FiberLean® MFC is a game changer for paper production and quality. As thorough technical adaptations and optimizations are required, our technical experts fully support the installation of FiberLean® MFC production facilities and the implementation of the FiberLean® MFC technology. They also help with the technical application and any paper production or quality concerns. FiberLean® MFC technology is more than just a filler increase technology. It enables our customers to develop next generation high quality paper grades.
What benefits can Omya Multifill® concept provide?

Omya Multifill® is an integral but flexible concept to optimize paper in quality, performance and costs. It enables more independent raw material procurement, optimizes production processes, increases productivity and enhances profitability. Paper producers may benefit from:

- Cost savings through replacement of fibers by mineral
- Cost savings through reduced energy demand, favored by easier dewatering & drying at higher filler loads
- Enhanced runability through better wet strength properties
- Improved paper properties (physical and optical)
- Upgraded paper quality facilitating finishing, printing & further processing
- Creation of specific paper characteristics, opening new markets
- Improved competitiveness

Make your choice for improved productivity & profitability
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