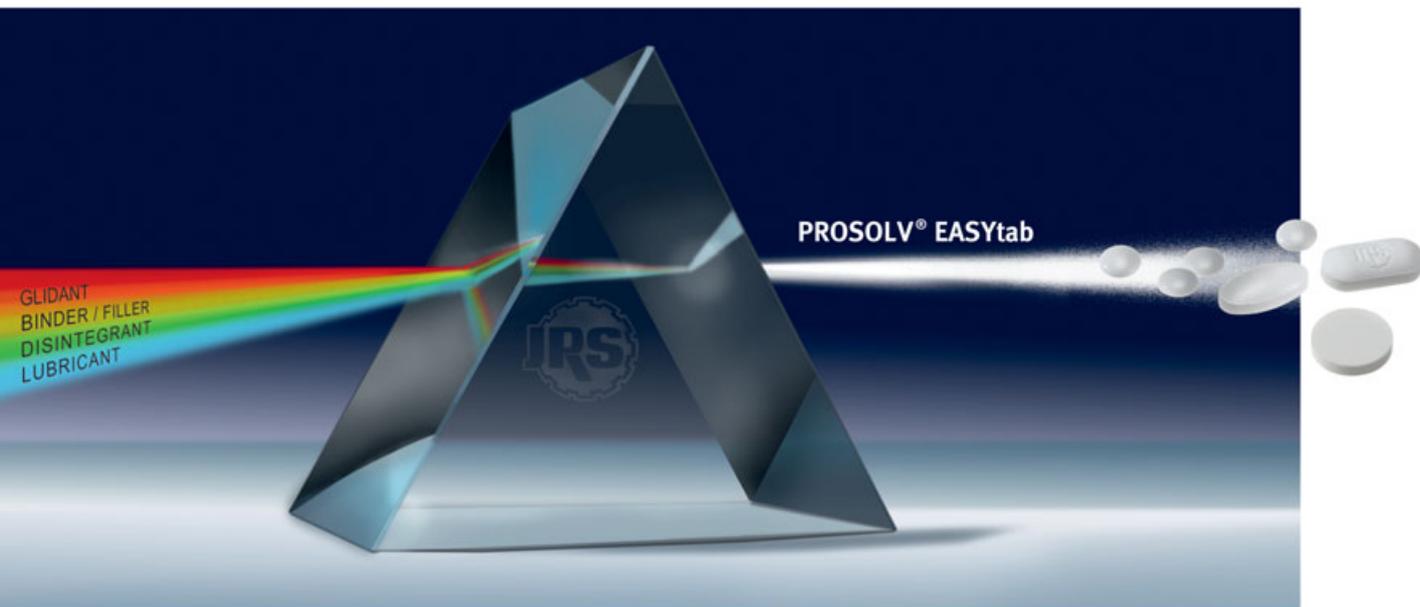


# PROSOLV® EASYtab

Ready-to-Use, High Functionality Excipient Composite  
for Pharmaceutical and Nutraceutical Tablets



**Offering**  
More Production Output  
Superior Tablets  
Less Handling  
Fast Time to Market

## Streamline Your R&D and Production

### Introduction

The health science industry faces a wide variety of challenges including increased pressure to:

- Reduce costs
- Accelerate time to market
- Improve product performance
- Cope with high demands and tight capacities
- Utilize modern technology

These challenges drive health science companies to find new solutions for improving time- and cost-efficiency in oral dosage form development and production.

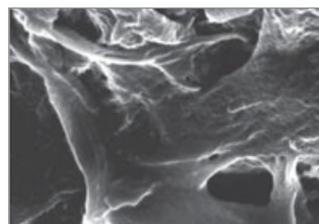
Formulation scientists developing direct compression formulations generally require several conventional excipients – often at high levels – to obtain good material flow, compaction, blending properties, content uniformity, carrying capacity, stability, lubricity, and disintegration. Finding the proper excipient combinations and concentrations to achieve adequate solid dosage formulas is a time-consuming, and often expensive process, that varies with active pharmaceutical ingredient (API) characteristics.

The **PROSOLV® EASYtab line** was developed to provide an innovative solution to meet these challenges.

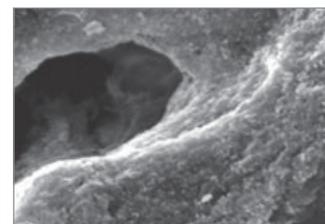
Beyond its benefits in conventional batch production, the **PROSOLV® EASYtab line** presents a set of properties that make it well-suited for continuous manufacturing (see page 9). Because it acts multifunctionally as a filler/binder, flow aid, disintegrant, and lubricant at the same time, production requires only two feeders. This not only leads to space saving, but also helps to simplify control of the production process.

The unique surface structure and good flowability of the **PROSOLV® EASYtab line** enable fast and segregation-free blending with APIs.

### PROSOLV® Technology



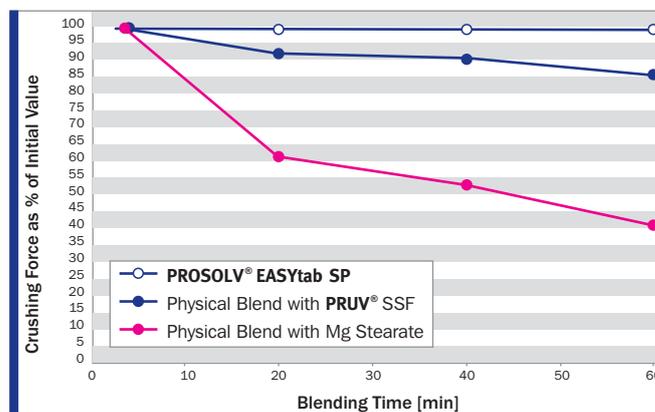
Pic. 1 Regular MCC with Smooth Surface Areas.



Pic. 2 Micro-Rugosity Introduced by **PROSOLV® Technology**.

Compounding with the **PROSOLV® Technology** leads to a homogeneous distribution of the individual components throughout the particle and on its surface. The synergistic effects achieved by this technology include better compactability, flowability, and content uniformity, due to a significantly increased surface area.

Furthermore, its all-in-one structure provides outstanding robustness in terms of blending times:



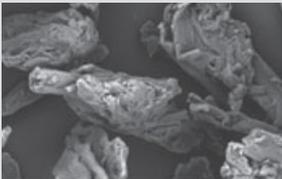
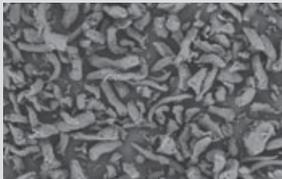
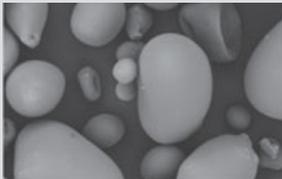
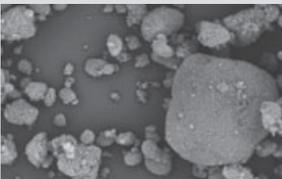
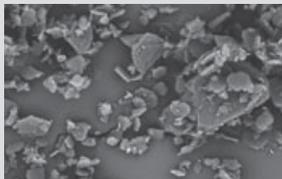
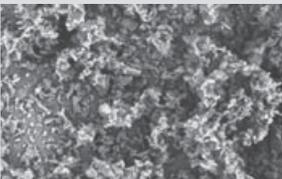
Graph 1 Effect of Blending Time on Tablet Hardness. **PROSOLV® EASYtab SP** in Comparison with Physical Mixtures of Microcrystalline Cellulose (MCC), Colloidal Anhydrous Silica (CSD), Sodium Starch Glycolate (SSG) and Sodium Stearyl Fumarate (SSF) or Magnesium Stearate, Respectively, as a Lubricant.

## What is PROSOLV® EASYtab ?

The **PROSOLV® EASYtab** line was developed using JRS PHARMA's proven **PROSOLV® Technology** and is the first lubricated high functionality excipient (HFE) on the market. **PROSOLV® EASYtab** is an all-in-one, ready-to-use excipient composite. It effectively combines all functionalities required for tableting in a single excipient composite.

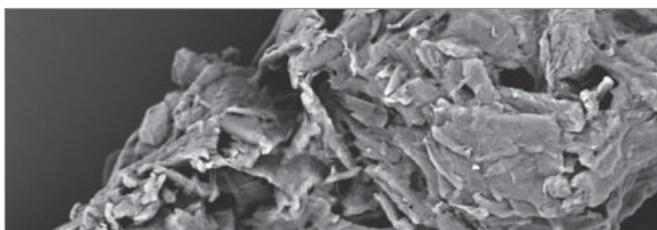
**PROSOLV® EASYtab** is more than a simple physical blend. It is a homogeneous, lubricated high functionality excipient composite. Each component of the composite maintains its chemical identity while synergistically providing increased functional performance.

### PROSOLV® EASYtab Composition

		or	
<b>Microcrystalline Cellulose (MCC)</b> Filler/Binder	<b>Croscarmellose Sodium (CCS)</b> Disintegrant		<b>Sodium Starch Glycolate (SSG)</b> Disintegrant
		or	
<b>Colloidal Silicon Dioxide (CSD)</b> Flow Aid	<b>Sodium Stearyl Fumarate (SSF)</b> Lubricant		<b>Magnesium Stearate (MgSt)</b> Lubricant

### PROSOLV® TECHNOLOGY

- Homogeneous, monoparticulate composite
- High functionality excipient
- Enhanced flowability
- Enlarged surface area



Pic. 3 PROSOLV® EASYtab Particle.

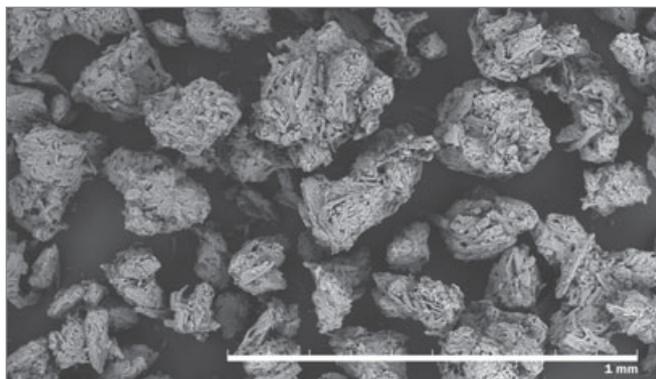
### Product Overview PROSOLV® EASYtab

Grade	Filler/Binder	Flow Aid	Disintegrant		Lubricant	
	Microcrystalline Cellulose	Colloidal Silicon Dioxide	Croscarmellose Sodium	Sodium Starch Glycolate	Sodium Stearyl Fumarate	Magnesium Stearate
<b>PROSOLV® EASYtab SP</b>	X	X		X	X	
<b>PROSOLV® EASYtab SP LM</b>	X	X		X	X	
<b>PROSOLV® EASYtab Nutra CM</b>	X	X	X			X
<b>PROSOLV® EASYtab Nutra GM</b>	X	X		X		X
<b>PROSOLV® EASYtab Nutra CP</b>	X	X	X		X	

Tab. 1 Composition of the Different Grades of PROSOLV® EASYtab.

## 6 Elements of Success

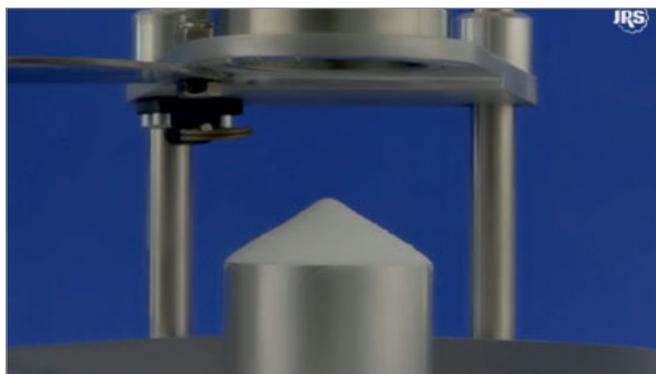
**Powder flow**, blend **homogeneity** and good **compatibility** are prerequisites for successful tableting. Mechanical **robustness** of tablets enables dust-free **coating** and packaging. **Fast disintegration** is essential for in-vivo performance of the tablet. **PROSOLV<sup>®</sup> EASYtab** combines these 6 elements of success in one excipient:



Pic. 4 SEM of **PROSOLV<sup>®</sup> EASYtab NUTRA** Particle Size and Morphology of the Composite Material Enable Good Powder Flow and High Content Uniformity.

### 1. Excellent Powder Flow

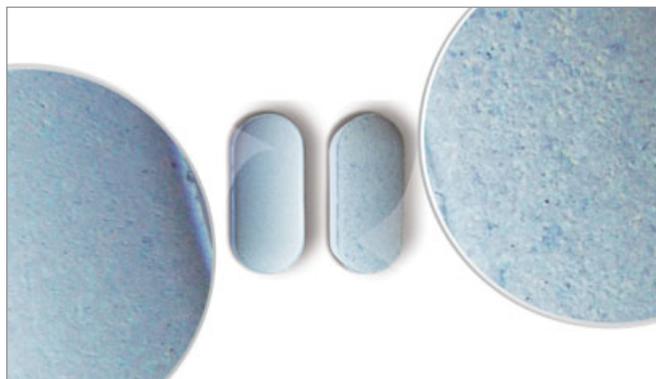
Due to its favorable particle morphology, **PROSOLV<sup>®</sup> EASYtab** shows significantly better powder flow properties than the corresponding physical mixture of its individual ingredients. **PROSOLV<sup>®</sup> EASYtab** is therefore perfectly suited for direct compression processing, even on high speed tablet presses.



Pic. 5 Excellent Flowability of Members of the **PROSOLV<sup>®</sup>** Family as Shown by the Angle of Repose.

### 2. Superb Blend Homogeneity

The composite nature of **PROSOLV<sup>®</sup> EASYtab** prevents segregation of the individual excipient components. Moreover, the porous surface structure promotes adhesion of low-dose, micronized active ingredients, thus improving the content uniformity in the powder blend and the finished product (see page 6).



Pic. 6 The Surface Structure Promotes Interactive Blending and, thus, Homogeneous Distribution of Fine-Particle APIs in the Tablet Matrix. The Tablet on the Left was Formulated with **PROSOLV<sup>®</sup> EASYtab** and a Blue Dye as a Model API. The Formulation Based on Regular MCC (right) Shows a Spotty Appearance Indicating in Homogeneous Distribution of the Model API.

### 3. Outstanding Compatability Performance

The excellent compaction and lubrication of **PROSOLV® EASYtab** result in less capping and breakage, increasing yields and improving profitability. With **PROSOLV® EASYtab**, mechanically robust tablets can be produced at low compaction force. This leads to prolonged equipment and tooling life.

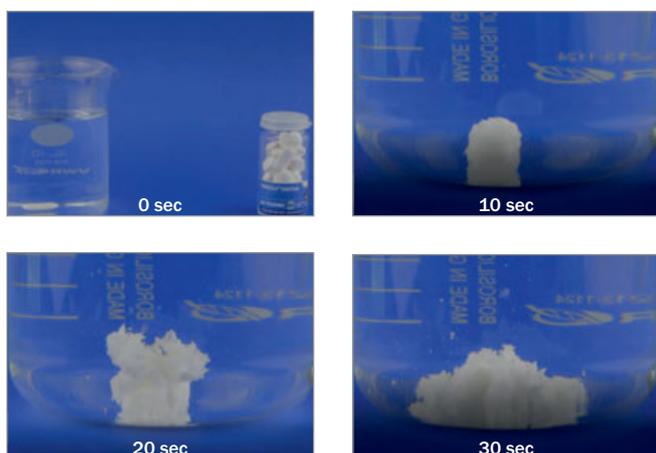
Due to a smaller excipient amount needed and the possibility of high active ingredient loads, smaller tablet sizes and lower tablet weight can be reached, which results in high patient compliance.

### 4. Ultimate Robustness, Tablet Handling

**PROSOLV® EASYtab** tablets are mechanically robust and have a low friability, even in the case of demanding tablet shapes. Tablet robustness enables all packaging and coating options. **PROSOLV® EASYtab** tablet production generates less dust. Tableting with **PROSOLV® EASYtab** can reduce cleaning and change – over times (see pages 7 and 8).

### 5. Rapid Disintegration

The built-in superdisintegrant enables rapid disintegration with minimum variation from tablet to tablet.



Pic. 7 Disintegration of a **PROSOLV® EASYtab** Tablet

### 6. Ideal for Film Coating

Due to its unique surface structure, the **PROSOLV® EASYtab line** is ideally suited for film-coated tablets. It enables crisp logo definition and excellent film adhesion to the core.

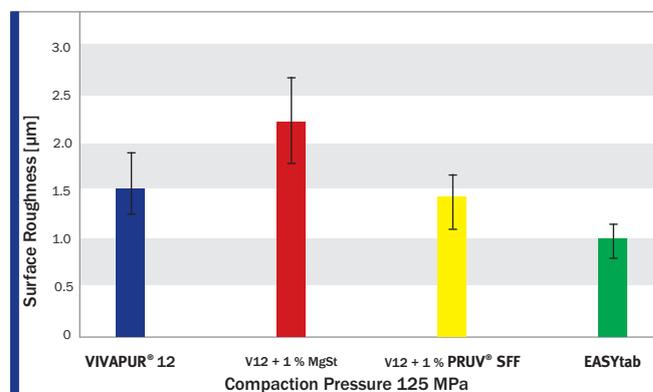
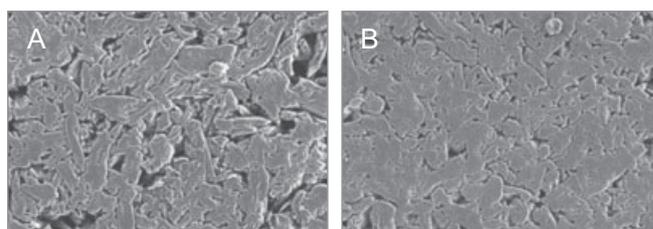


Fig. 1 Surface Roughness of Tablet Cores



Pic. 8 SEM Pictures of Tablet Surfaces. A: MCC, B: **PROSOLV® EASYtab**

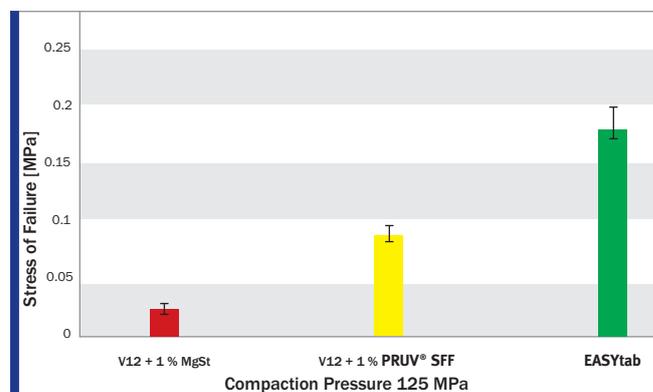


Fig. 2 Film Coating Adhesion

## Case Studies: Improving Content Uniformity in Low-Dose DC Formulations

### Folic Acid Direct Compression Tablets

Direct compression of low dosage APIs often leads to content uniformity issues. The unique **PROSOLV® Technology** used to produce **PROSOLV® EASYtab SP** creates a significant increase of the specific surface area

compared to the physical blend. This, along with its micro-rugosity, promotes high content uniformity with low dosage APIs.

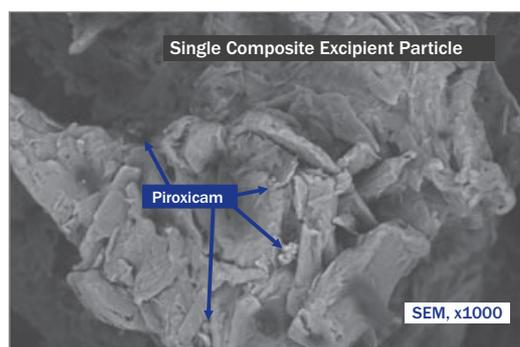
Formulation	PROSOLV® EASYtab SP [%]	Physical Mixture [%]
Folic Acid	5.0	5.0
<b>PROSOLV® EASYtab SP</b>	95.0	-
VIVAPUR® 102 MCC	-	91.5
EXPLATAB® SSG	-	1.0
PRUV® SSF	-	0.5
CSD	-	2.0
Total	100	100
Content Uniformity RSD	<b>1.24</b>	4.73

Tab. 2  
Case study: Folic Acid  
Tablets (8 mm, 100 mg) were  
Pressed on a IMA Kilian –  
Pressima 13EU-D.

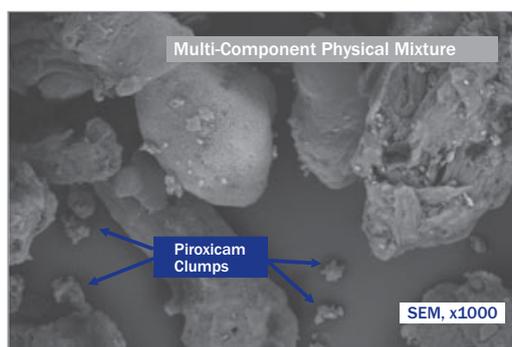
### Piroxicam Direct Compression Tablets

Formulation	PROSOLV® EASYtab SP [%]	Physical Mixture [%]
Piroxicam	5.00	5.00
<b>PROSOLV® EASYtab SP</b>	95.00	-
VIVAPUR® 102 MCC	-	91.68
VIVASTAR® P SSG	-	0.95
PRUV® SSF	-	0.47
CSD	-	1.90
Total	100.00	100.00
Content Uniformity RSD	<b>1.62</b>	19.56

Tab. 3  
Case Study: Piroxicam  
Tablets (8 mm, 200 mg) were  
Pressed on a IMA Kilian –  
Pressima 13EU-D.



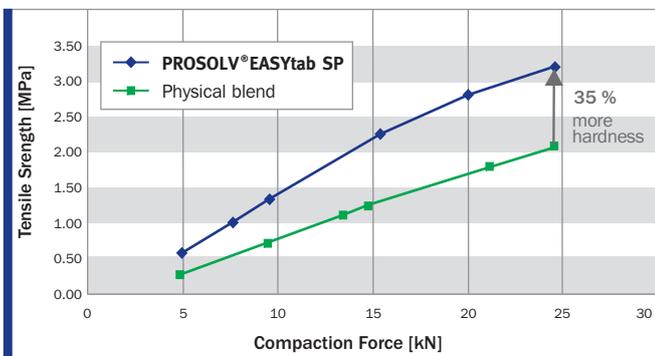
Pic. 9 Piroxicam Embedded in **PROSOLV® EASYtab SP**.



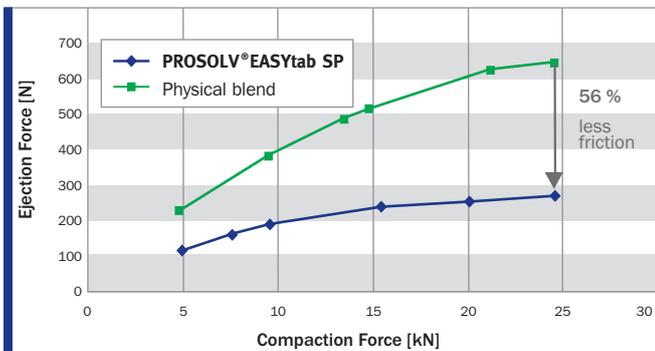
Pic. 10 Physical Mixture Plus Piroxicam.

# Case Studies: Medium-Dosage Paracetamol Formulation

In these formulations, the properties of the API dominate the formulation and compaction properties. A study with 40 % Paracetamol as a poorly compressible model API was performed to investigate the compaction properties of **PROSOLV® EASYtab SP** in a challenging formulation.



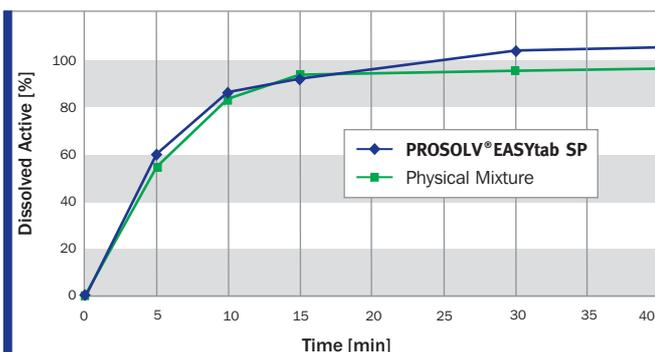
Graph 1 Compressibility 40 % Paracetamol Formulation.



Graph 2 Ejection Force 40 % Paracetamol Formulation

## Case Study: Poorly compressible API PROSOLV® EASYtab SP + Paracetamol

Tablets (13 mm, 500 mg) were pressed on a IMA Kilian – Pressima 13 EU-D.



Graph 3 Dissolution Profile 40 % Paracetamol Formulation

## Conclusion

The analyzed tablets showed significantly improved tablet properties in comparison to the tablets made from the physical blend.

**PROSOLV® EASYtab SP** tablets exhibited

- 30 – 50 % higher robustness (tensile strength)
- 100 % higher lubrication efficiency on average
- Similar dissolution profiles for both products

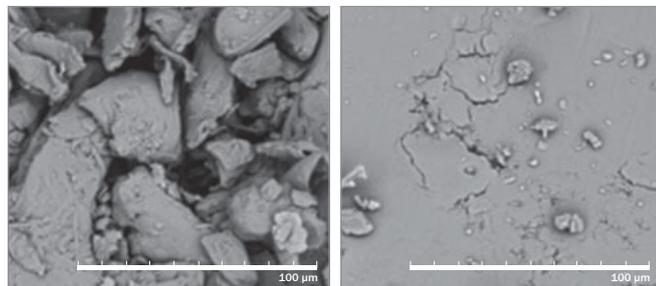
## Case Studies: Probiotics

Although probiotics are mostly administered in the form of capsules, there are some advantages of tablets in terms of production effort, cost efficiency and stability of the probiotic bacteria. Probiotics are sensitive to high pressure and temperature. For this reason, the suitability of **PROSOLV® EASYtab Nutra** for direct compression of probiotic tablets was tested. As **PROSOLV® EASYtab Nutra** is an all-in-one composite, only one mixing step is required before the compaction, making the tableting process easy and comfortable. In order to evaluate the performance of **PROSOLV® EASYtab Nutra**, the survival rate of the bacteria and functional tablet properties were determined and compared to a lactose-based formulation.

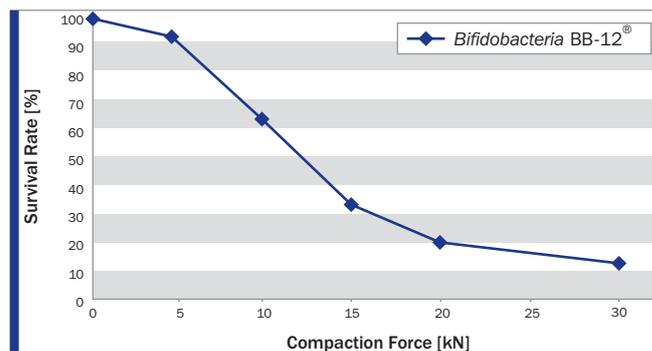
Parameter	Formulation 2 (PROSOLV® EASYtab Nutra)	Formulation 1 (Spray-Dried Lactose)
Survival Rate [%]	91.5	58.4
Compression Force*[kN]	9.8	30.5
Disintegration Time [s]	18	172
Friability [%]	0.25	0.31
Water Activity [-]	0.26	0.13

Tab. 4 Characteristics of the Probiotic Powder Blends and Tablets.

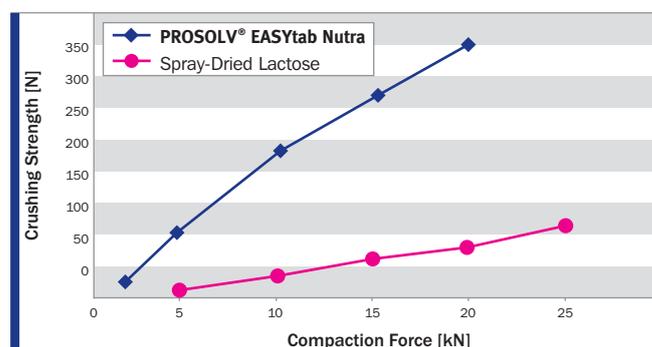
\* Required for Tablets with 80 N Crushing Strength



Pic. 11 Tablet Surface of Probiotic Tablets with a Crushing Strength of 80 N Containing **PROSOLV® EASYtab Nutra** (left) and Spray-dried Lactose (right), Respectively.



Graph 4 Correlation between Compression Force and Viability of Bacteria Cells in Directly Compressed Probiotic Tablets Containing 20 % of the Bifidobacteria Strain BB-12®.



Graph 5 Crushing Strength of **PROSOLV® EASYtab Nutra** and Spray-Dried Lactose at Different Compaction Forces.

### Conclusion

- Exceptionally high survival rate of over 90 %
- Excellent compactibility, resulting in good tablet hardness at moderate compression forces
- Disintegration within 18 s, 10 times faster than the lactose-based formulation
- Low friability
- Appropriate water activity for usage in probiotic applications

# Advantages of **PROSOLV® EASYtab** in Continuous Tablet Manufacturing

Continuous Manufacturing Technology continues to gain importance in pharmaceutical manufacturing. Multifunctional excipients such as **PROSOLV® EASYtab** may be particularly well-suited for continuous processes, because of three of their unique features:

## 1. All-in-one Structure

A typical tablet formulation consists of at least one API, a filler/binder, a disintegrant, and a lubricant. Thus, even a simple formulation consists of at least four ingredients to be accurately fed into the system. The use of multifunctional excipients may, therefore, be advantageous. **PROSOLV® EASYtab** especially stands out in terms of combining all the required functionalities into a single co-processed excipient. Using **PROSOLV® EASYtab**, the number of necessary feeder units can be reduced to just two, one for the active ingredient and one for the excipient composite.

## 2. Blend Uniformity

Achieving a good blend uniformity is essential for any tableting process, be it batch or continuous. In continuous processes, blending is particularly demanding, because in comparison to batch processes, dwell-times in the blender are limited. The blending advantages of **PROSOLV®** products are outstanding, due to their unique surface structure, enabling good homogeneity even for low dose APIs via interactive blending.

## 3. Blending Robustness

Another critical aspect of blending is the risk of over-lubrication resulting from excessive blending. It is, therefore, advantageous to select lubricants for continuous manufacturing, which are less sensitive to blending times and conditions or to choose all-in-one excipients such as **PROSOLV® EASYtab SP** or **ROSOLV® EASYtab Nutra CP**. These contain the particle lubricant within their unique structure and are, thus, less sensitive towards overlubrication.

## Conclusion

- The **PROSOLV® EASYtab line** is especially well suited for continuous manufacturing
- Only 2 feeders needed
  - one for the API
  - one for the **PROSOLV® EASYtab** composite which acts as filler/binder, flow aid, disintegrant and lubricant at the same time
- Unique surface structure enables fast and segregation-free blending with API's
- Outstanding robustness in terms of blending time, especially for the SSF containing **PROSOLV® EASYtab SP** and **PROSOLV® EASYtab CP**



Pic. 12 Continuous Tablet Manufacturing Line.  
(Courtesy of University of Eastern Finland, Kuopio)

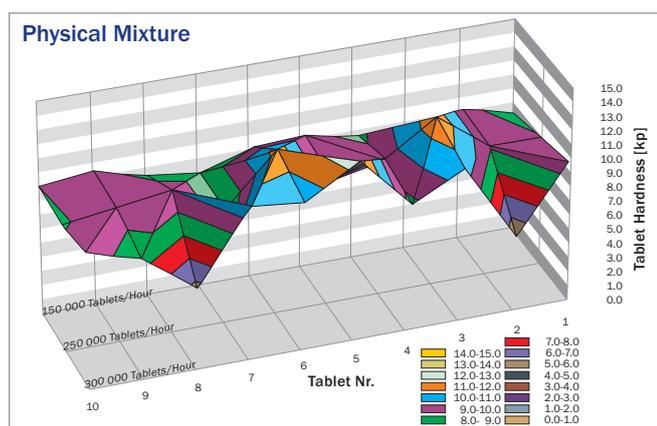
## Case Studies: High-speed Tableting of **PROSOLV® EASYtab SP**

### Introduction

The reduction of tablet manufacturing costs has become increasingly important for the pharmaceutical industry. One of the ways to save production costs is to increase the speed of tableting to produce more tablets in the same amount of time. An improvement of the tableting process often requires the need to simplify the formulation through the use of high functionality excipients.

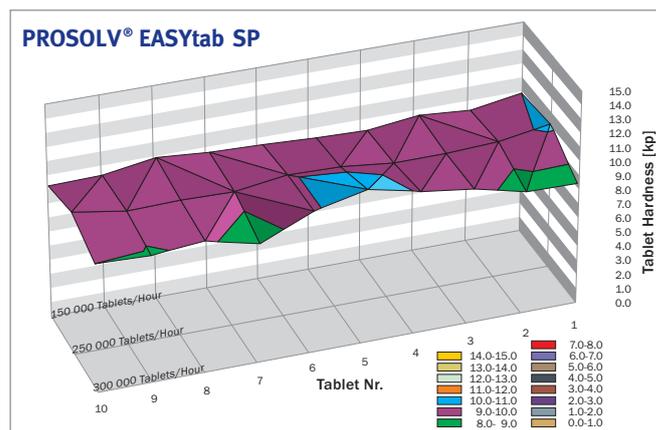
The lubricated high functionality excipient **PROSOLV® EASYtab SP** provides the necessary robustness and consistency of the tablet manufacturing, leading to increased production efficiency and tremendous cost savings.

**PROSOLV® EASYtab SP** and the corresponding physical blend of the single components were compared in high speed compression on a FETTE 2090i tablet press. Paracetamol was used as a model API in a dose of 40 %. The tablet characteristics, as well as the production costs, were compared.



Graph 7 Tablet Hardness Uniformity –\*  
Physical Mixture with 40 % Paracetamol.

\* as function of tableting speed



Graph 8 Tablet Hardness Uniformity –\*  
**PROSOLV® EASYtab SP** with 40 % Paracetamol.

**PROSOLV® EASYtab SP** showed constantly, high tablet hardness, while the physical mixture has significant variations especially when the tableting speed was increased to 300.000 tablets per hour.

	Physical Mixture 100.000 Tablets/h	<b>PROSOLV® EASYtab SP</b> 300.000 Tablets/h
Weighing + Sieving	4 h	2 h
Production Time	60 h	20 h
<b>Total</b>	<b>64 h</b>	<b>22 h</b>

Tab. 5 Production Time for 6 Million Tablets.

### Conclusion

- **PROSOLV® EASYtab** converts technical benefits into commercial success.
- **PROSOLV® EASYtab SP** is ideally suited for high-speed tableting equipment.
- Faster tablet production leads to more efficient output.
- In this case study a 300 % increase in production speed led to 2/3 cost reduction.
- **PROSOLV® EASYtab** is a great way to increase capacity without investing in new buildings and machines and adapt to increased market demands quickly without capital risk.

## Benefits of PROSOLV® EASYtab

### Simplify Tableting

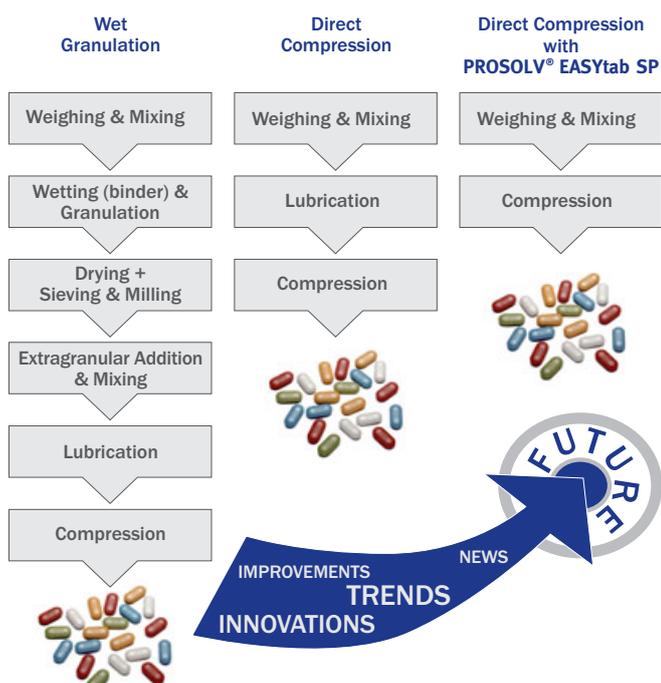


Fig. 1 Comparison of the Number of Production Steps for Different Ways of Manufacturing Tablets.

Traditional tablet production methods include dry granulation, wet granulation, and direct compression.

Granulation processes are typically complex, requiring a great deal of equipment, human resources, and time. The lengthy, multi-stage process leaves room for error, and thus, batch losses. Direct compression is a shorter, and often preferred, production process. It requires fewer resources than wet granulation and leaves less room for error and batch loss (Figure 1).

The **PROSOLV® EASYtab** line includes all the necessary excipients for direct compression in an all-in-one-composite. Simply add the APIs, blend and compress into tablets. This easy method of tableting allows for shorter development times and, therefore, faster market entry, as well as lower R&D costs. The outstanding compaction properties enable smaller tablet sizes, faster production and may boost profitability due to prolonged tooling life. With **PROSOLV® EASYtab**, buy, analyse and store only one excipient instead of five, thus reducing storage and quality control costs.

### Regulatory Information

- GMO-Free
- Allergen-Free
- BSE/TSE-Free
- Complies with general chapters for residual solvents (USP <467>, Ph. Eur. 5.4)
- Re-evaluation date: 3 years
- US DMF available for
- Full regulatory package available
- Regulatory information available for registration in all major markets.

#### Packaging

20 kg carton box with MDPE liner bag

#### Pallet

16 carton boxes (320 kg) on Euro pallet (800 x 1200 mm)

20 carton boxes (400 kg) on container pallet (975 x 1175 mm)

#### Sample Sizes

400 g or 2 kg in aluminium bag

#### Disclaimer:

The information provided in this brochure is based on thorough research and is believed to be completely reliable. Application suggestions are given to assist our customers, but are for guidance only. Circumstances in which our material is used vary and are beyond our control. Therefore, we cannot assume any responsibility for risks or liabilities, which may result from the use of this technical advice.

## The Global Excipient Maker

### Products and Services

#### Excipients

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- Functional Fillers
- Lubricants
- Thickeners+Stabilizers
- Carriers
- Superdisintegrants
- Calcium Supplements

#### Coatings

#### Biopharma Services

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- Excipients
- Coatings
- Biopharma Services
- JRS Sales Companies
- Technical Competence Centers
- Application Lab's

Additionally, dedicated representatives in almost every country.

