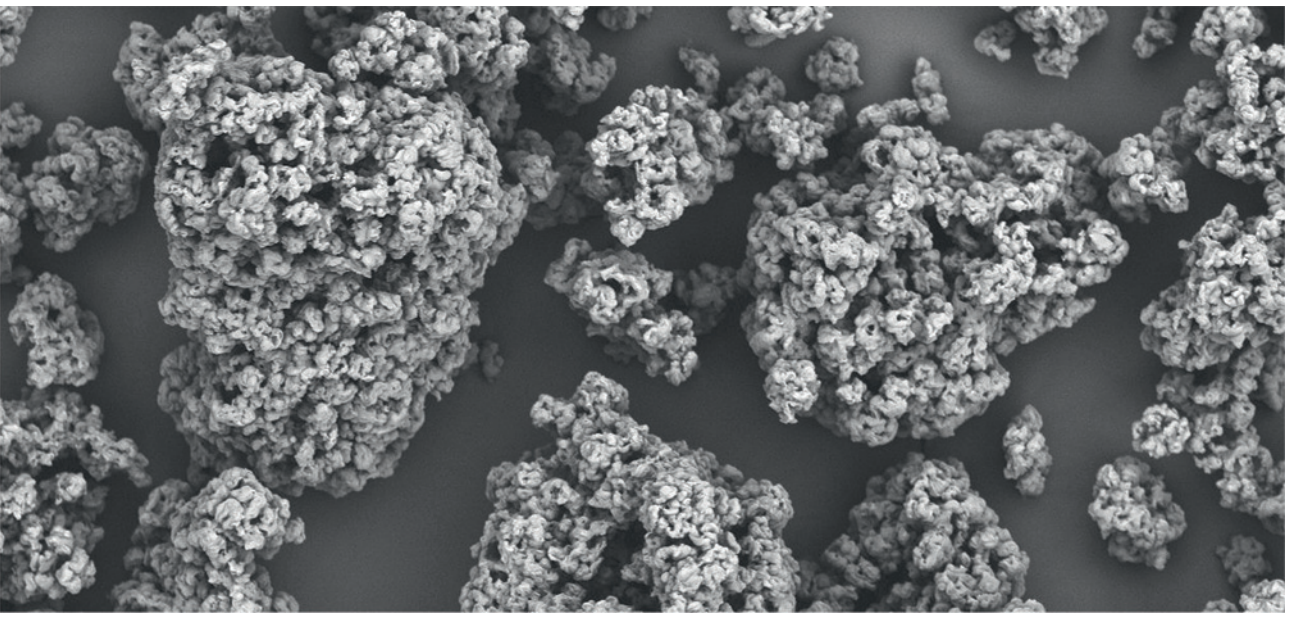
VIVAPHARM® PVPP

Crospovidone, Ph.Eur, USP/NF, JP, E 1202, FCC



Unsurpassed Disintegration Performance and Versatility

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VIVAPHARM® PVPP

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Introduction

Tablet disintegration involves the fast breakage of a solid dosage structure via contact with water or gastric fluids. It enables dissolution of the bio-active components as a prerequisite for achieving the desired and required bioavailability. **VIVAPHARM® PVPP**, Crospovidone, is unsurpassed in its performance and versatility as a superdisintegrant in formulations.

VIVAPHARM® PVPP is made up of water-insoluble synthetic crosslinked homopolymers of N-vinylpyrrolidone (Figure 1).

VIVAPHARM® PVPP combines different mechanisms to achieve rapid tablet disintegration at low concentrations (1 - 5 %). Due to its viscoelasticity, **VIVAPHARM® PVPP** is highly compactable, resulting in robust tablets with increased tensile strength and reduced friability. Scanning electron microscope images of **VIVAPHARM® PVPP** show a granular and porous structure with a large surface area (Figure 2). **VIVAPHARM® PVPP** enhances the dissolution of poorly soluble drug actives. Due to its nonionic property, it does not bear any risk of interaction with cationic APIs.

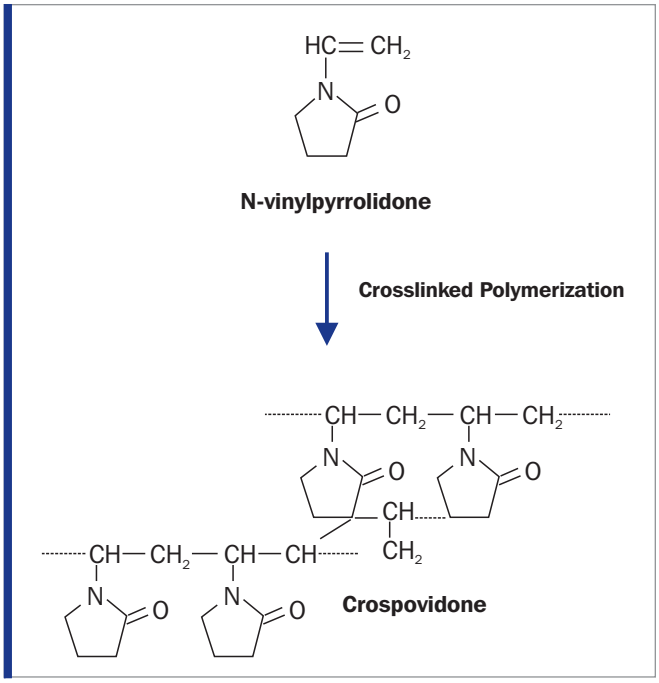

Fig. 1: Chemical Structure of **VIVAPHARM® PVPP** Crospovidone from the Crosslinked Polymerization of N-vinylpyrrolidone

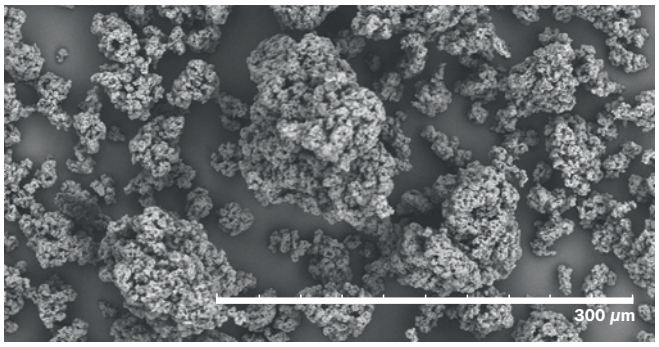

Fig. 2: Typical Scanning Electron Micrograph of **VIVAPHARM® PVPP**

Physical Properties

- Water-insoluble
- Granular and highly porous
- Viscoelastic deformation
- High cross-link density
- Free-flowing powder
- High surface area to volume ratio
- Non-ionic polymer

VIVAPHARM® PVPP is available in two particle sizes to serve different application requirements.

Products	Compendial Type	Typical Average Particle Size [µm]
VIVAPHARM® PVPP XL	Type A	125
VIVAPHARM® PVPP XL-10	Type B	30

Tab. 1

Mechanisms of Disintegration

There are three main disintegration mechanisms: swelling, wicking, and shape recovery.

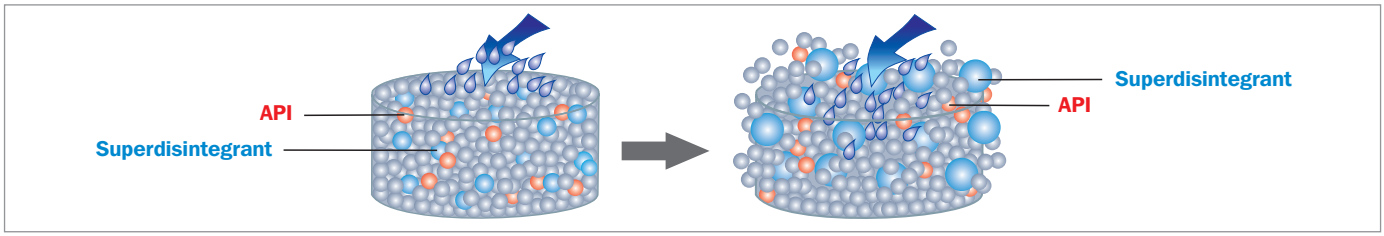

Fig. 3: **Swelling:**
Disintegrants expand and break up the tablet matrix from within. Common examples of excipients that exhibit swelling are starch-based superdisintegrants such as **EXPLOTAB**® and **VIVASTAR**® (Sodium Starch Glycolate). Swelling-type disintegrants are generally best suited for water-insoluble matrices such as Microcrystalline Cellulose and Dibasic Calcium Phosphate.

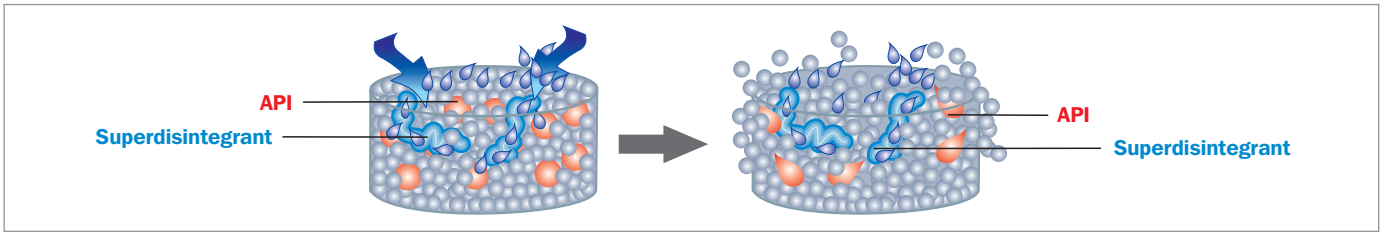

Fig. 4: **Wicking:**
Fluid is drawn into the tablet and dissolves the tablet matrix rapidly. Common examples of excipients that exhibit wicking include cellulose-based superdisintegrants such as **VIVASOL**® (Croscarmellose Sodium). Wicking-type disintegrants are generally best suited for water-soluble matrices such as Dextrates, Lactose, and Polyols.

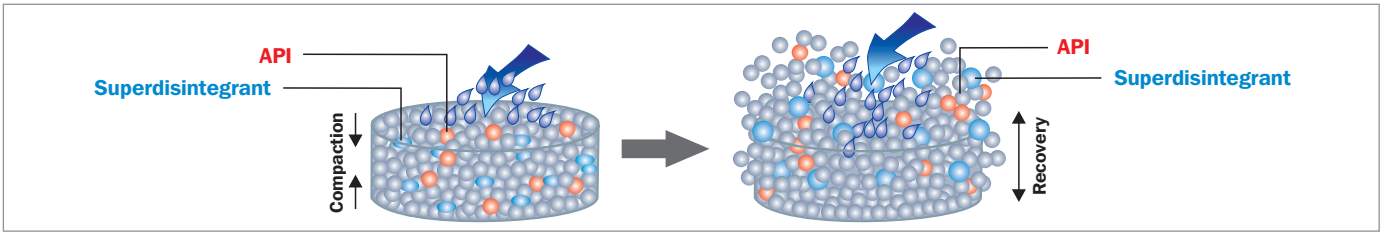

Fig. 5: **Shape Recovery:**
Disintegrant particles return to their pre-compaction shape and stored energy of the disintegrant is released upon contact with fluid. An example of such disintegrant is starch.

VIVAPHARM® PVPP, Crospovidone, is the choice superdisintegrant for rapid tablet disintegration at low concentrations because it uniquely exhibits all three of these disintegration mechanisms.

Wicking	Shape Recovery	Swelling
Water is drawn rapidly into the tablet via capillary action	High compressibility results in rapid recovery to original structure	Swells upon contact with water without gel formation

VIVAPHARM® PVPP, Crospovidone

VIVAPHARM® PVPP

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Benefits

- Rapid disintegration at low concentrations (1 - 5 %)
- Functions via a combination of disintegration mechanisms: wicking, shape recovery, and swelling, thus imparting its unsurpassed versatility as a superdisintegrant in formulations
- Suitable for direct compression, wet granulation, and dry granulation
- Increased tablet tensile strength and reduced friability due to high compressibility. Especially suitable for poorly compressible APIs
- No gel formation even at higher concentrations (10 %), ideal for ODTs
- Non-ionic polymer – no ionic interaction with cationic APIs to retard drug release, unlike anionic disintegrants, which may slow dissolution due to interaction with cationic APIs (i.e. Ranitidine, Cetirizine)

Grades

VIVAPHARM® PVPP XL

- The standard superdisintegrant for all immediate release tablet formulations.
- A larger particle size and increased porosity leads to rapid wicking and swelling. And thus, rapid disintegration.

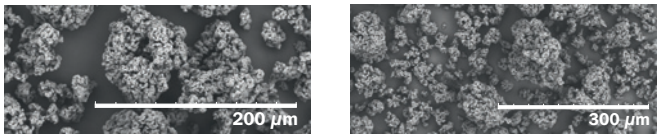


Fig. 6: Typical Scanning Electron Micrograph of **VIVAPHARM® PVPP XL**
(Left x500 Magnification, Right x250 Magnification)

VIVAPHARM® PVPP XL-10

- A finer particle size makes this grade suitable for ODTs and chewable tablet formulations that require smooth mouthfeel and rapid disintegration.

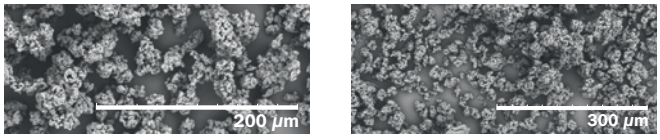
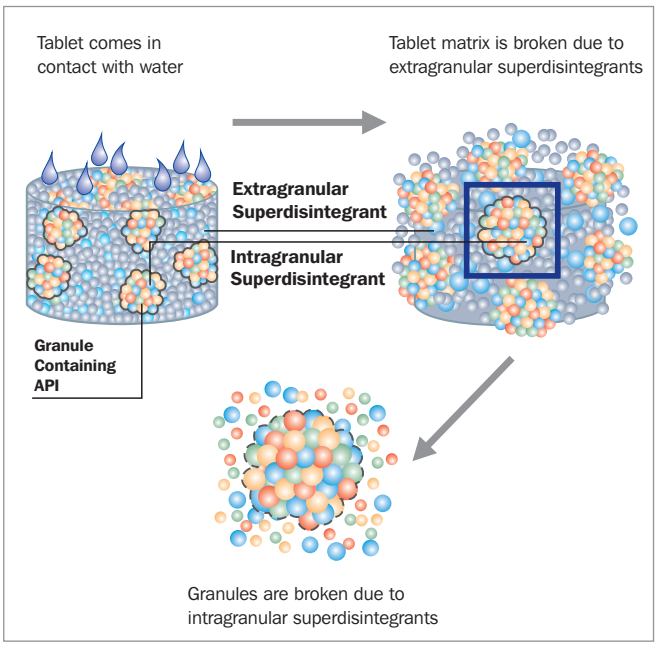


Fig. 7: Typical Scanning Electron Micrograph of **VIVAPHARM® PVPP XL-10**
(Left x500 Magnification, Right x250 Magnification)

Applications

Wet Granulation

Ideal intra and extragranular superdisintegrant due to high wetting capacity without gel formation during the granulation process.



Dry Granulation

Ideal intra- and extragranular superdisintegrant due to excellent compressibility and high surface area to volume ratio.

Direct Compression

Free-flowing property translates to easy handling. Unique, viscoelastic characteristic results in high compressibility which increases tablet tensile strength and reduces friability. Especially suitable for poorly compressible APIs.

Special Applications

Dissolution and bioavailability enhancement of poorly water-soluble BCS Class II APIs, e.g. Mefanamic acid [1] or BCS Class IV, e.g. Furosemide [2]. Solubility and dissolution efficiency can be even more enhanced in combination with PVP K30 [1].

Case Study

Formulation Characteristics

A combination of water-insoluble and water-soluble, medium-compactable matrix was chosen to compare the functionality of **VIVAPHARM® PVPP XL** and **XL-10** against equivalent products.

Formulation Results of VIVAPHARM® PVPP XL

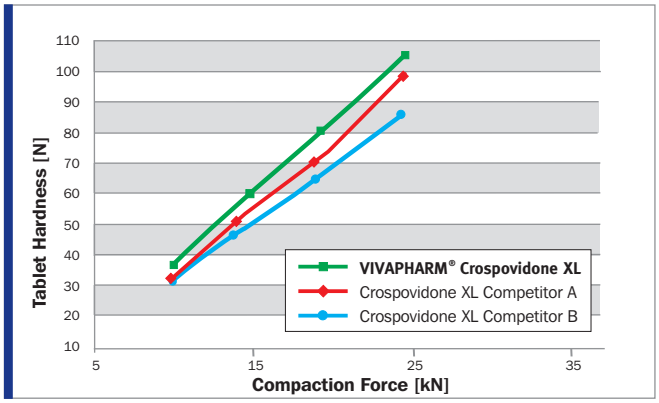
The performance of **VIVAPHARM® PVPP XL** is comparable to marketed products A and B in terms of disintegration time and tablet tensile strength.

Formulation

Products	Amount [%]
EMCOMPRESS® (Dibasic Calcium Phosphate)	72.75
Spray-dried Lactose	24.25
Crospovidone	2
PRUV® (Sodium Stearyl Fumarate)	1
Total	**100**

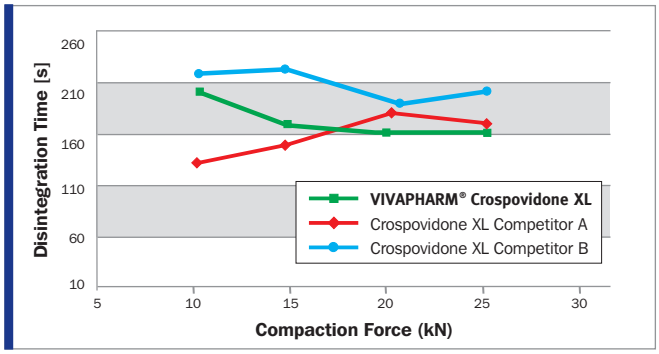
Tab. 2

Tablet Hardness

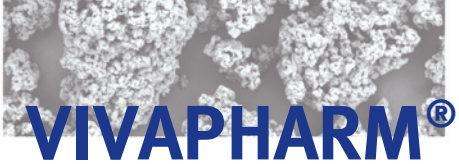


Graph 1: Compression Force Profile of Tablets Containing Dibasic Calcium Phosphate and Lactose with Crospovidone XL

Tablet Disintegration



Graph 2: Disintegration Profile of Tablets Containing Dibasic Calcium Phosphate and Lactose with Crospovidone XL



VIVAPHARM® PVPP

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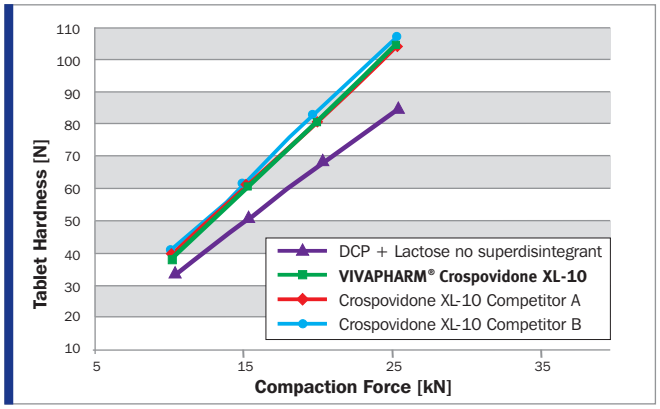
Formulation Results of VIVAPHARM® PVPP XL-10

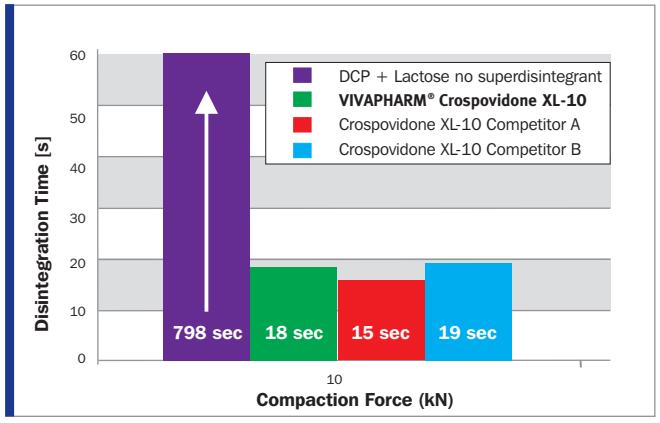
VIVAPHARM® PVPP XL-10 provided the additional benefit of increasing tablet hardness of the medium-compactable matrix of DCP and lactose of up to 25 %. The disintegration time was also dramatically reduced from 13 minutes to less than 20 seconds. The performance of **VIVAPHARM® PVPP XL-10** is comparable to other established Crospovidone XL-10 products in terms of disintegration time and tablet crushing strength.

Tablet Hardness



Graph 3: Compression Force Profile of Tablets Containing Dibasic Calcium Phosphate and Lactose with and without Crospovidone XL-10

Tablet Disintegration



Graph 4: Disintegration Profile of Tablets Containing Dibasic Calcium and Lactose with and without Crospovidone XL-10

Summary

The case study demonstrates the effectiveness of **VIVAPHARM® PVPP** as a superdisintegrant for a tablet matrix containing both water-soluble (lactose) and insoluble (dibasic calcium phosphate), medium-compactable fillers. The performance of **VIVAPHARM® PVPP** was compared to other crospovidone products in the market.
As illustrated above, both **VIVAPHARM® PVPP XL** and **VIVAPHARM® PVPP XL-10** have similar performance to equivalent products in terms of compactibility and disintegration capabilities.

The choice of tablet matrix in the case study illustrates the disintegration mechanism of **VIVAPHARM® PVPP**. **VIVAPHARM® PVPP XL** ensures rapid disintegration regardless of compaction force. Furthermore, **VIVAPHARM® PVPP XL-10** offers additional benefits in increasing tablet tensile strength without a compromise in its disintegration efficiency.

The unsurpassed performance and versatility of **VIVAPHARM® PVPP** lies in its intrinsic properties:

- Water-insoluble, granular, and highly porous – facilitates wicking of fluid into tablet matrix
- Viscoelastic deformation – elasticity that results in shape recovery upon contact with fluid
- High cross-link density – swells by 90 % to 120 % in water without gelling
- Free-flowing powder – suitable for direct compression
- Unique particle morphology that results in excellent compressibility – increases tablet tensile strength and reduces friability. Especially suitable for poorly compressible APIs

Regulatory Information

- Conforms to the current Ph. Eur., USP/NF and JP/JPE
- Certificate of Suitability (CEP) by the EuropeanDirectorate for the Quality of Medicines & HealthCare (EDQM)
- DMFs are filed with the US Food and Drug Administration (FDA)
- Halal and Kosher compliant
- Listed in the Inactive Ingredient Database (IID) on the FDA website as an approved ingredient in New Drug Applications (NDA)
- **VIVAPHARM® PVPP** is listed by the European authorities (E 1202) and in the Food Chemicals Codex (FCC) by the FDA for its application in nutraceutical tablets such as vitamins, herbal extracts, sweeteners, etc.
- Regulatory approvals in all major markets including: USA, Europe, Japan, Mexico, Australia, India, China, and many more

Packaging, Samples, and Storage

Storage:
Store in original container. Protect from excessive heat and moisture. Opened containers should be reclosed and stored in a manner which minimizes exposure to oxygen.

Packaging:
All Povidone, Copovidone, and Crospovidone products are known to form peroxides upon prolonged exposure to oxygen. As part of our commitment to ensuring the quality and stability of our products, **VIVAPHARM® PVPP** is packaged in 20 kg drums with multifoil LDPE/EVOH inliners under tightly controlled packaging conditions. EVOH has been carefully selected due to its outstanding gas barrier properties. Minimizing the entry of oxygen into the primary packaging minimizes the potential of peroxide formation. LDPE remains as the product contact layer. The choice of packaging has a significant impact of prolonging the shelf-life and guaranteeing the stability of **VIVAPHARM® PVPP**.

Sample Size:
400 g

References

[1]. Nagabhushanam et al. Int J Pharm Pharm Sci 2010, Vol 3(1), 1619.

[2]. Shin et al. Int. J. Pharm 1998, 175, 17-24.

Case Studies

Case studies and formulation examples are available upon request. Please contact your sales rep for more information or visit *www.jrspharma.com.*

Disclaimer:
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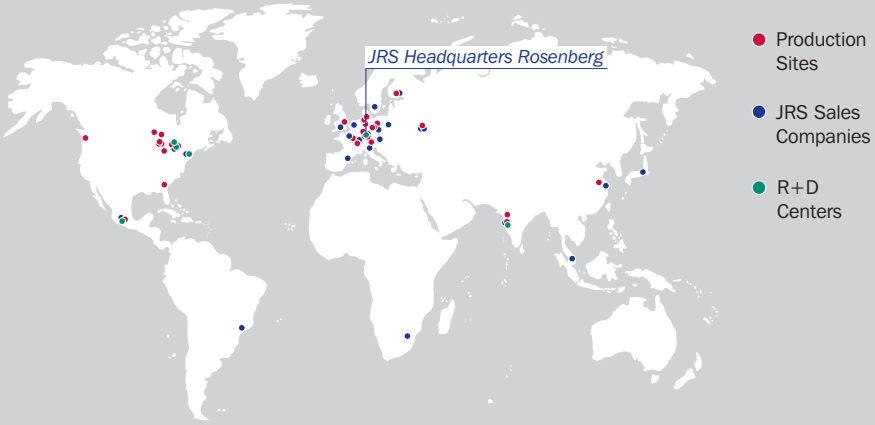

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