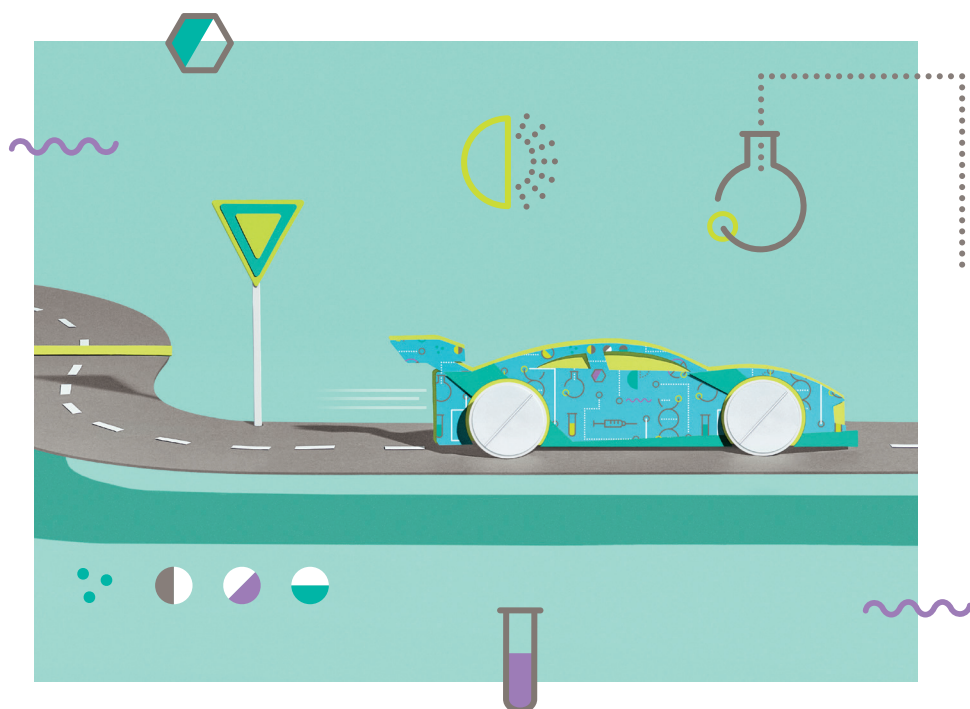


benecel™ XRF HPMC controlled release matrix formers

high-quality HPMC for high-speed tableting

key features

- **optimized polymer structure and particle morphology:** provides exceptional powder flow and tablet strength
- **consistent particle size distribution and bulk density:** consistent content uniformity and low tablet weight variability
- **maintains tablet strength as tablet press speed increases**
- **superior interfacial bonding strength and layer strength**
- **fine particle size**
- **available at three viscosity levels:** K4M, K15M, and K100M, providing a wide range of dissolution profiles



description

Hypromellose continues to be the most successful polymer for hydrophilic matrix tablets, the dominant technology for controlled-release applications. Benecel™ XRF HPMC products have been optimized for controlled-release matrix tablets providing robust tablets and consistent drug release, especially for high speed tableting operations.

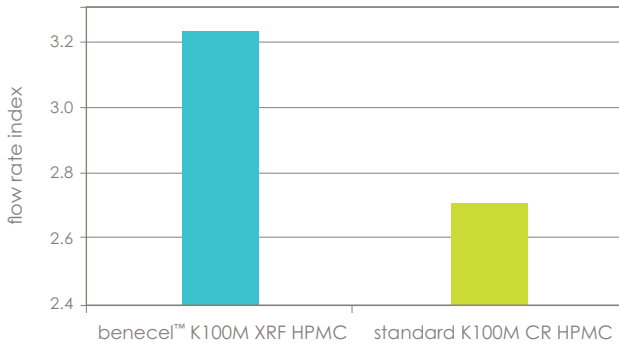
table 1. certificate of analysis specifications

grade	particle size, d90 (µm)	2% viscosity (mPas)	hp content (%)	methoxyl content (%)
K4M	170 – 195	2,700 – 5,040	4.0 – 12.0	19.0 – 24.0
K15M	170 – 195	13,500 – 25,200	7.0 – 12.0	19.0 – 24.0
K100M	170 – 195	100,000 – 140,000	9.2 – 10.7	22.5 – 24.0

[†] This product conforms to the monograph for hypromellose type 2208 in the current NF,EP,JP.

^{††} NDMA, Nitrates, Nitrites statement available upon request

figure 1. Brookfield flow function



Benecel™ XRF HPMC exhibits enhanced powder flow compared with standard K100M CR HPMC.

benefits

- o formulations exhibit lower strain rate sensitivity, enabling high throughput/high tablet press speeds
- o easily converts from stand-alone batch manufacturing to continuous manufacturing
- o suitable for both granulation and direct compression
- o produces robust multilayer controlled-release tablets

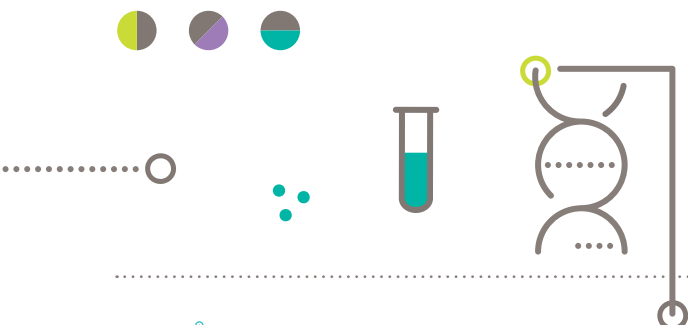
case study

large scale, high speed tableting operation

The objective of this study was to compare the performance of Benecel™ K100M XRF HPMC to a competitive equivalent in a large-scale, high-speed tableting operation. The following were evaluated: tablet breaking force, weight variability, and dissolution.

Table 2. formulation details

material	%	tablet weight (mg)
intragranular		
Metformin HCl	49.0	294.0
CMC 7HF	3.9	23.4
extragranular		
HPMC K100M	35.0	210.0
Avicel PH 102	12.0	72.0
Magnesium Stearate	0.1	0.6
total	100.0	600.0



During large-scale, high-speed tablet manufacturing, it is important to maintain consistent tablet weight throughout the entire production run. At both low and high tablet press speeds, Benecel™ XRF HPMC demonstrated better tablet weight uniformity than competitive HPMC (figures 2 and 3).

figure 2. consistent tablet weight uniformity, 45,600 tablets per hour

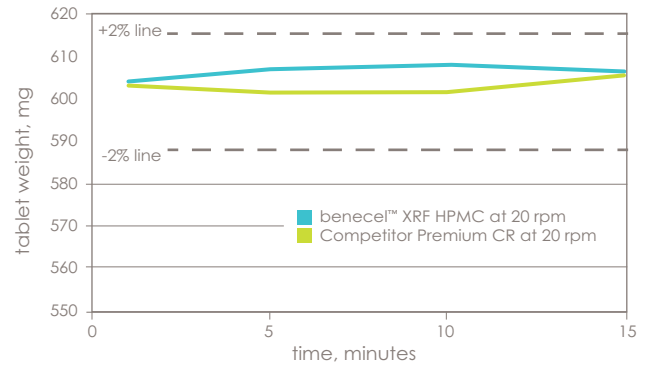
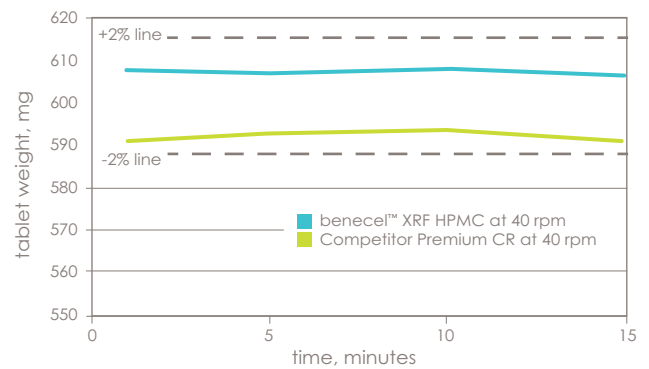


figure 3. consistent tablet weight uniformity, 91,200 tablets per hour



Tablet hardness is another attribute that needs to be maintained during large-scale tablet manufacturing. Superior, consistent tablet hardness leads to robust and consistent tablet performance. Benecel™ XRF HPMC produces harder tablets than competitive HPMC at both low and high tablet press speeds (figures 4 and 5).

figure 4. superior compactibility, 45,600 tablets per hour

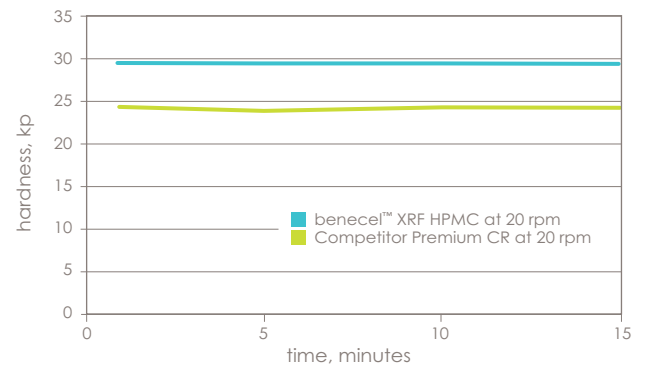
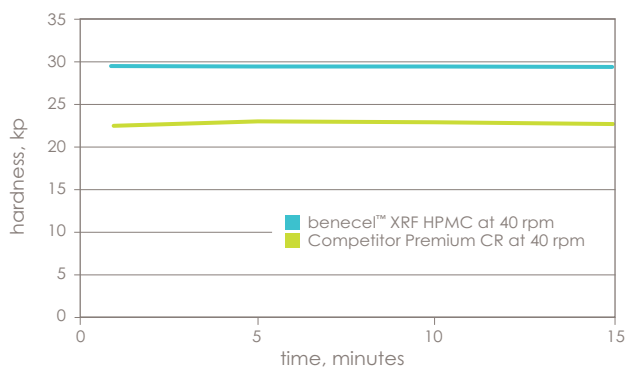


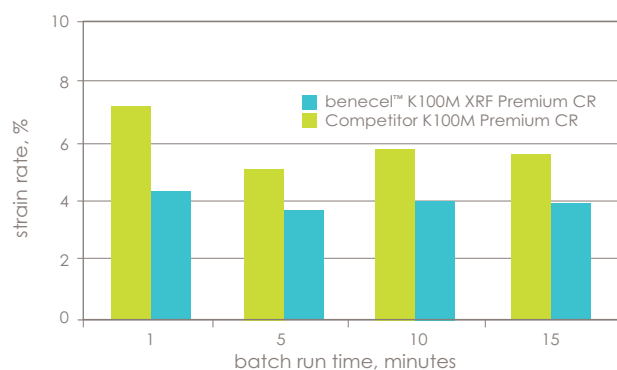
figure 5. superior compactibility, 91,200 tablets per hour



$$\text{strain rate sensitivity index (SRS)} = 100 \times \frac{(X20\text{rpm} - X40\text{rpm})}{X20\text{rpm}}$$

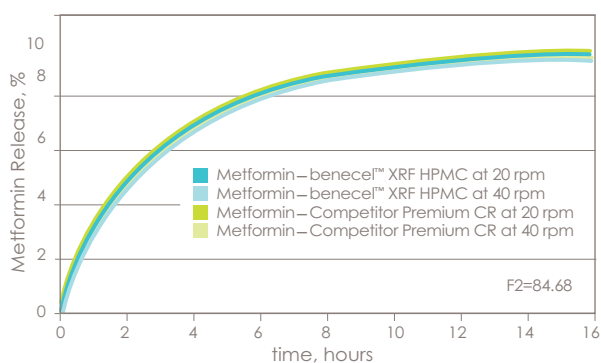
A low SRS is desirable, indicating little loss of tablet strength on scaleup and increased production speed. Benece™ XRF HPMC is less sensitive to variations in tablet press speed during large-scale, high speed tableting runs (figure 6).

figure 6. optimized strain rate sensitivity



Consistent drug release that meets compendial requirements is required for controlled release formulations. When using Benece™ XRF HPMC, dissolution results are consistent whether tableting at low or high tablet press speeds (figure 7).

figure 7. consistent dissolution

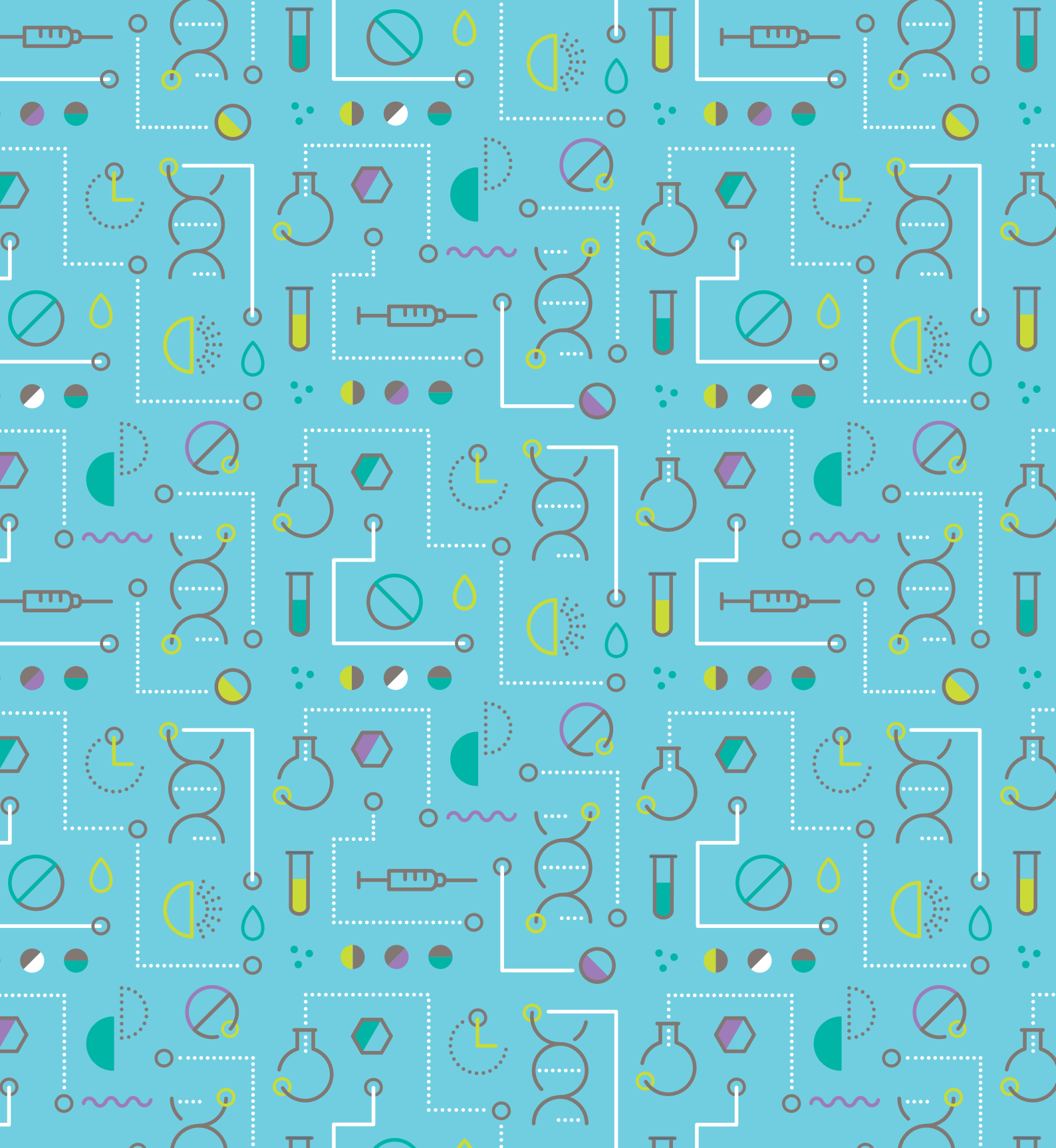


summary

Benece™ XRF HPMC is the ideal controlled release polymer choice for commercial scale high speed tablet production providing:

- superior tablet strength
- less sensitivity to change in tablet press speed
- reduced tablet weight variability
- reliable dissolution profiles

Additionally, Benece™ XRF HPMC is the first choice for multilayer tablets, providing superior interfacial bonding strength and layer strength.



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