

COMPARISON OF DIFFERENT METHODS OF BINDER ADDITION ON PARTICLE SIZE AND SHAPE FOR HIGH-SHEAR GRANULATION PROCESSES

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PURPOSE

To study the effects on particle size and shape for high-shear granulations using differing means of binder activation.

METHODS

Immediate release (IR) and controlled release (CR) formulations were granulated in a 25 liter high-shear mixer (GMX-25, Vector Corporation). Mixer blade speeds used standard manufacturer settings. Both formulations utilized dry binder which was activated by water addition. Water was added by pouring, pumping, and atomized spray. Granulations were split into two portions; one was wet-milled in a mill (COMIL 194S, Quadro) and dried in a fluid bed (FL-M-15, Vector Corporation); the other portion was only fluid bed dried. Resulting granulations were analyzed via sieve analysis and particle size imaging (QICPIC, Sympatec).

Note: Formulation and process parameters are listed in Tables 1 and 2.

Table 1 – Formulations

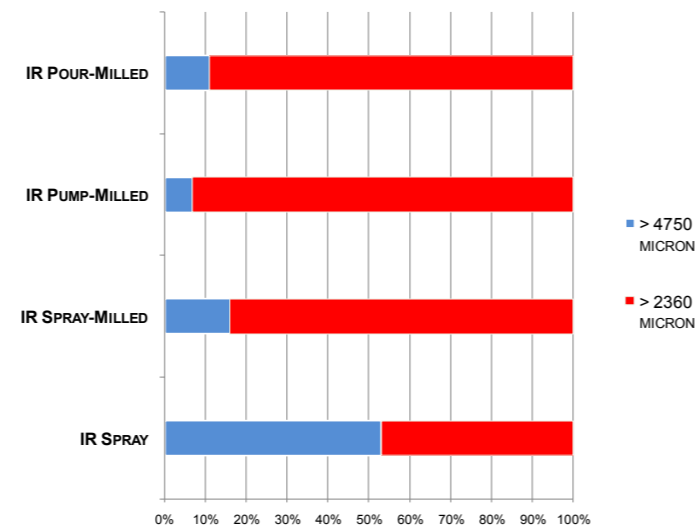
Ingredients	IR Granulations	CR Granulations
Lactose	55%	70%
Starch 1500	15%	-
MCC, Avicel PH-101	30%	-
HPMC, Methocel K4M	-	30%
Dry Weight (Kg)	6.1	5.6
Water Added (Kg)	1.8	2.2

Table 2 – Processing Parameters

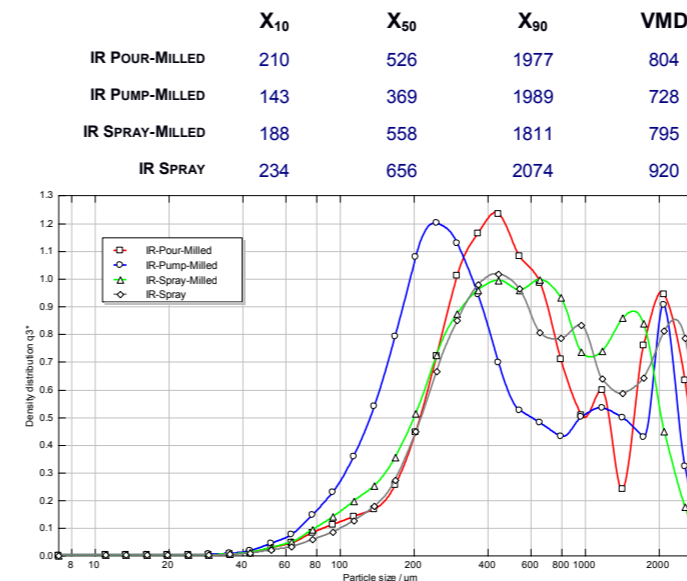
Wet Granulation	
Pre-Mix (Time/Tip Speed)	2.5 minutes / 5.4 mps
Infusion (Time/Tip Speed)	IR = 7 minutes / 5.4 mps CR = 9 minutes / 5.4 mps
Wet Mass (Time/Tip Speed)	3 minutes / 8.4 mps
Infusion Types	
Pour	All added in 30-60 seconds
Pump	IR = 210 g/min CR = 260 g/min
Spray	Same pump rates @ 70 kPa air pressure
Milling	
	Rounded Edge Blade; 900 rpm; 0.375 inch (9.5 mm) square hole screen
Drying	
	52-57°C final product temperature

RESULTS

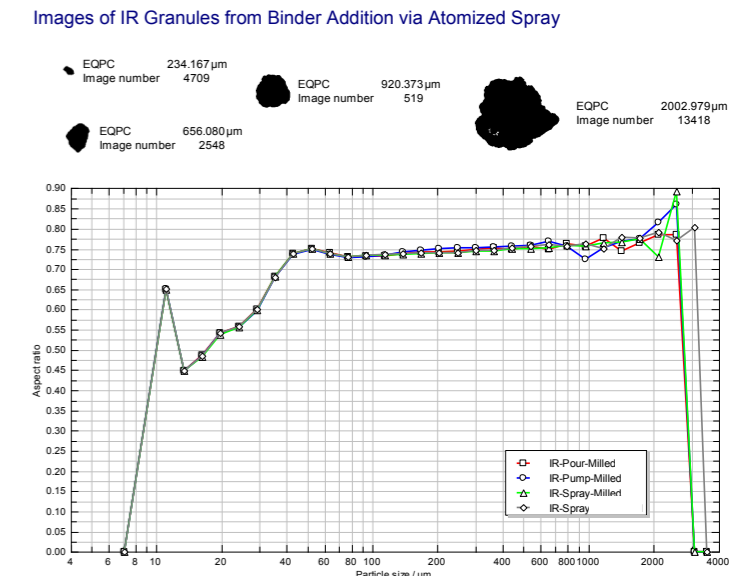
IR Sieve Comparison > 2350 micron



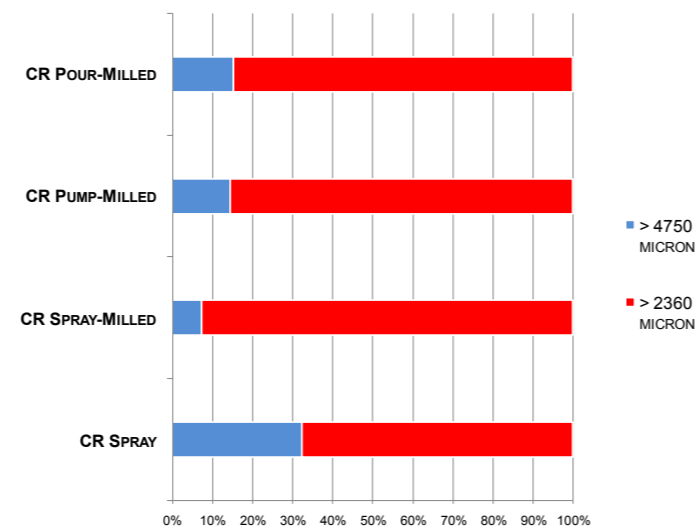
IR Particle Size Analysis < 2350 micron



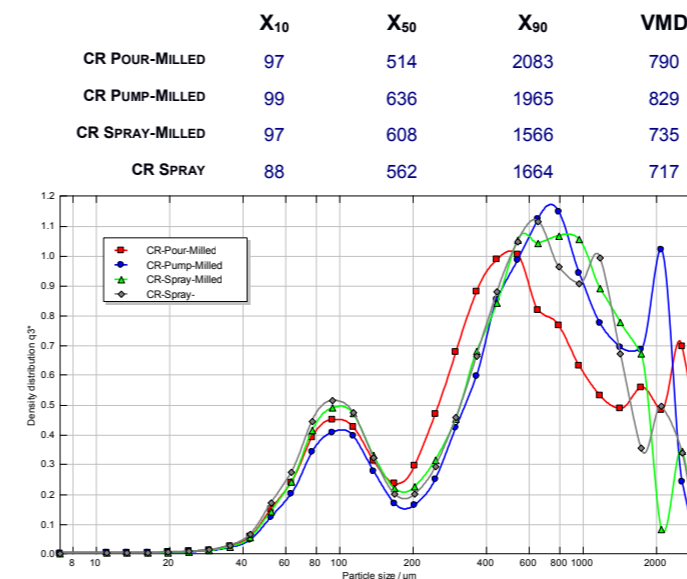
IR Particle Image Analysis < 2350 micron



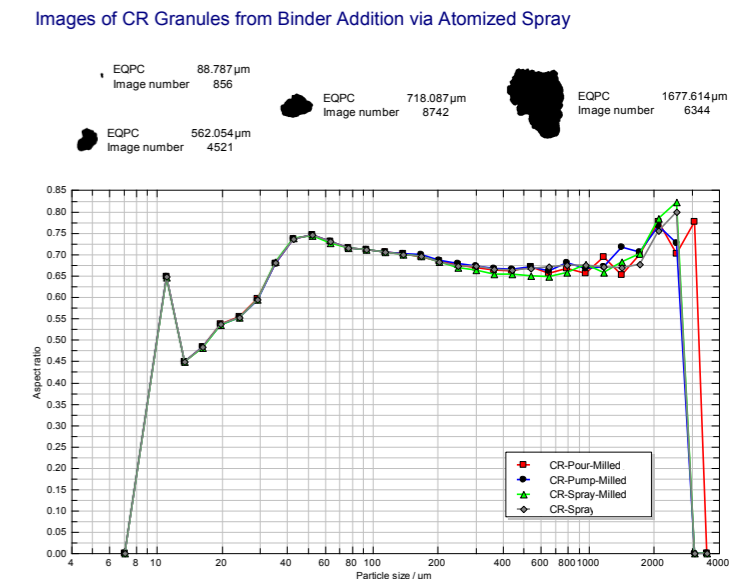
CR Sieve Comparison > 2350 micron



CR Particle Size Analysis < 2350 micron



CR Particle Image Analysis < 2350 micron



CONCLUSIONS

The means of adding binder will have differing degrees of effects on particle size and shape depending on the type of formulation used for high-shear granulations. Imaging techniques do offer an excellent means of understanding how granulations are impacted by differing processing methods/steps.

Image Processing

