



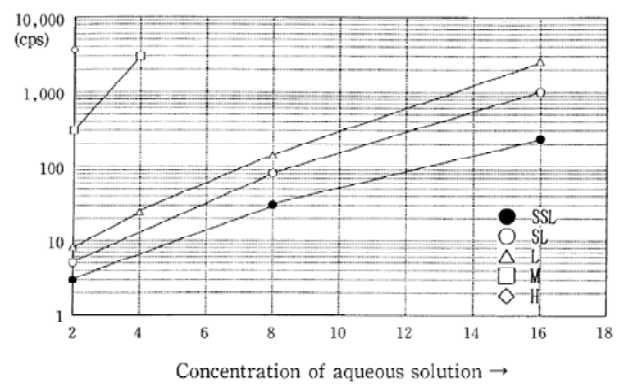
# Application Note

Note No.	Application
WG 04	Wet Granulation

## Using Low Viscosity HPC-SL, -SSL as a Binder

Nisso’s **special low (SL)** and **super special low (SSL)** grades of low viscosity HPC offer several key benefits to your formulation:

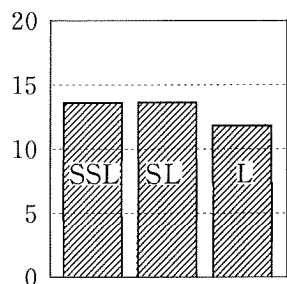
- Due to lower viscosity, handling of the **granulation is easier**—less sticking.
- Low viscosity allows for concentration of binder to be increased which can **speed up** granulation time.
- Low viscosity grades improve **tablet hardness** and **friability** without compromise of the **disintegration profile**.



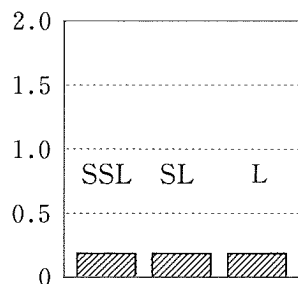
Contents	Section
Comparison of HPC-L, -SL, and -SSL	1
Varying the amount of HPC for SL and SSL grades	2
Varying the concentration of HPC for SL and SSL grades	3
Test protocol	4

## 1. Granule and Tablet Properties: Comparison of HPC-L, SL, and SSL

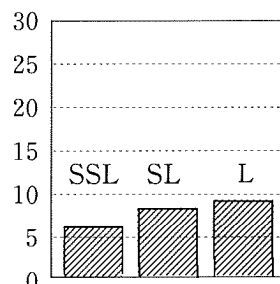
### a. Summary of results



Hardness (kg)



Friction loss (%)



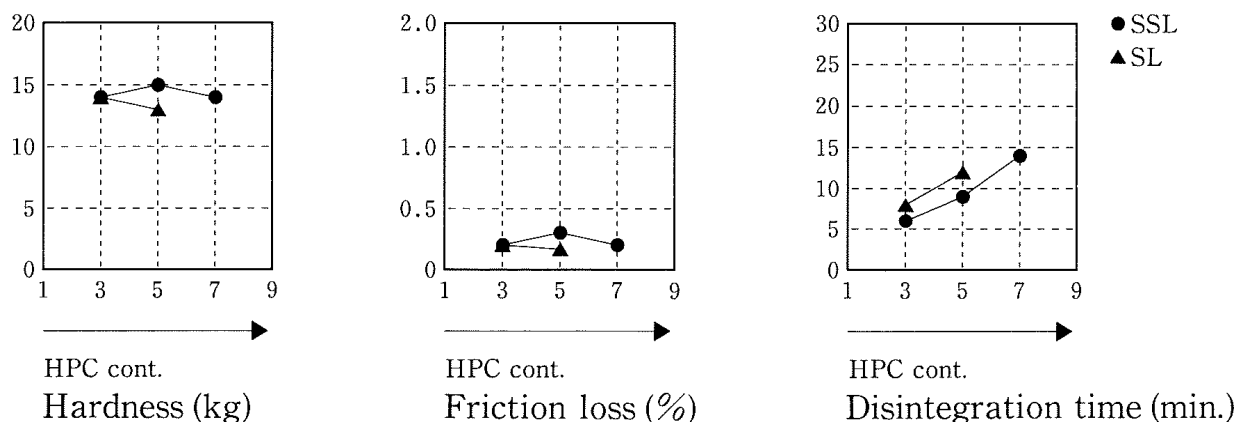
Disintegration time (min)

### b. Test Data

Experimental No.		1	2	3	
Kinds of HPC (viscosity at 20°C 2% aqueous solution)		SSL (2.9cps)	SL (5cps)	L (8cps)	
material	Lactose (g)	700	700	700	
	Corn starch (g)	300	300	300	
	8% HPC aqueous solution (g)	375	375	375	
	(HPC cont.) (g)	(30)	(30)	(30)	
property of granule	Particle size distribution (%)	No. 12 (1400 $\mu$ ) on	0.2	0.2	—
		No. 30 ( 500 $\mu$ )	0.2	0.2	0.4
		No. 42 ( 355 $\mu$ )	0.4	0.6	1.7
		No. 60 ( 250 $\mu$ )	1.3	2.1	8.4
		No. 83 ( 180 $\mu$ )	4.0	6.0	14.4
		No.100 ( 150 $\mu$ )	8.0	9.6	15.6
		No.140 ( 106 $\mu$ )	22.1	22.1	24.7
		No.200 ( 75 $\mu$ )	30.3	26.9	19.6
		No.200 pass	33.6	32.3	15.0
			D <sub>50</sub> ( $\mu$ )	90	95
Bulk (kg/cm <sup>3</sup> )	density	loose	0.50	0.47	0.46
		packed	0.62	0.61	0.56
Angle of repose (°)		39	38	37	
property of tablet	Hardness (kg)		14	14	12
	Friction loss (%)		0.2	0.2	0.2
	Disintegration time (min)		6	8	9

## 2. Varying quantity of SL and SSL

### a. Summary of results

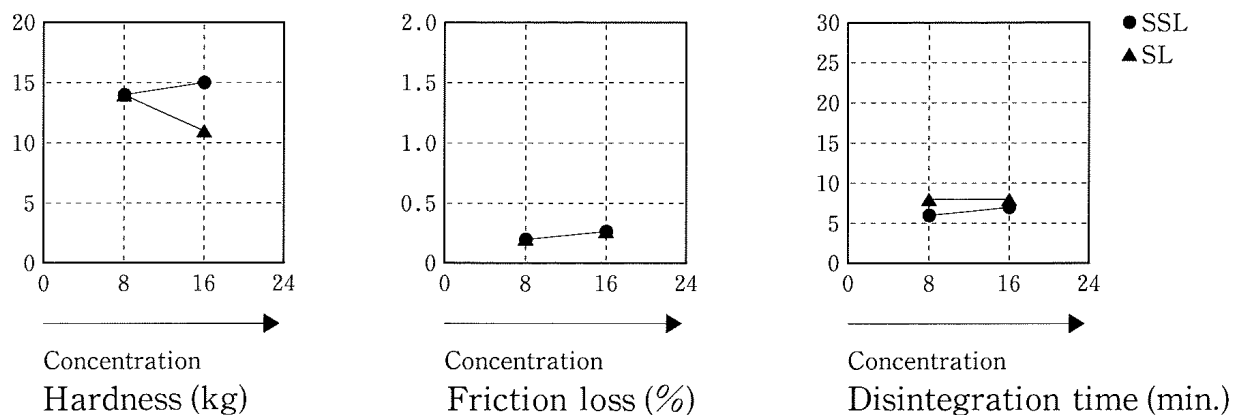


### b. Test Data

Experimental No.		1	4	5	2	6	
Kinds of HPC		HPC-SSL			HPC-SL		
Quantity of HPC (%)		3	5	7	3	5	
material	Lactose (g)	700	700	700	700	700	
	Corn starch (g)	300	300	300	300	300	
	8wt% HPC aqueous solution(g)	375	625	875	375	625	
	(HPC cont.)(g)	(30)	(50)	(70)	(30)	(50)	
property of granule	particle size distribution (%)	No. 12 (1400 $\mu$ ) on	0.2	0.2	0.6	0.2	0.2
		No. 30 (500 $\mu$ )	0.2	0.2	0.6	0.2	0.2
		No. 42 (355 $\mu$ )	0.4	0.6	3.6	0.6	1.2
		No. 60 (250 $\mu$ )	1.3	3.4	14.0	2.1	7.8
		No. 83 (180 $\mu$ )	4.0	11.1	25.4	6.0	19.9
		No. 100 (150 $\mu$ )	8.0	15.5	20.2	9.6	19.5
		No. 140 (106 $\mu$ )	22.1	29.2	23.2	22.1	27.5
		No. 200 (75 $\mu$ )	30.3	26.0	10.4	26.9	19.3
		No. 200 pass	33.5	13.8	2.0	32.3	4.4
		D <sub>50</sub> ( $\mu$ )	90	120	170	95	150
Bulk (kg/cm <sup>3</sup> )	loose	0.50	0.45	0.45	0.47	0.45	
	packed	0.62	0.56	0.54	0.61	0.56	
Angle of repose (°)		39	38	38	38	38	
property of tablet	Hardness (kg)	14	15	14	14	13	
	Friction loss (%)	0.2	0.3	0.2	0.2	0.2	
	Disintegration time (min)	6	9	14	8	12	

### 3. Varying Concentration of HPC-SL and -SSL

#### a. Summary of results



#### b. Test Data

Experimental No.			1	7	4	8
Kinds of HPC			HPC-SSL		HPC-SL	
Concentration of HPC aqueous solution (%) (viscosity at 20°C) (cps)			8 (30)	16 (230)	8 (80)	16 (1000)
material	Lactose (g)		700	700	700	700
	Corn starch (g)		300	300	300	300
	8wt% HPC aq. (g)		375	188	375	188
	(HPC cont.) (g)		(30)	(30)	(30)	(30)
property of granule	particle size distribution (%)	No. 12 (1400 $\mu$ ) on	0.2	0.2	0.2	0.2
		No. 30 (500 $\mu$ )	0.2	0.4	0.2	1.6
		No. 42 (355 $\mu$ )	0.4	1.5	0.6	6.9
		No. 60 (250 $\mu$ )	1.3	5.3	2.1	9.9
		No. 83 (180 $\mu$ )	4.0	8.7	6.0	10.8
		No. 100 (150 $\mu$ )	8.0	10.4	9.6	9.4
		No. 140 (106 $\mu$ )	22.1	18.0	22.1	14.3
		No. 200 (75 $\mu$ )	30.3	19.5	26.9	37.7
		No. 200 pass	33.5	36.2	32.3	9.2
		D <sub>50</sub> ( $\mu$ )	90	95	95	110
	Bulk density	loose	0.50	0.53	0.47	0.56
		packed	0.62	0.68	0.61	0.75
	Angle of repose (°)		39	39	38	44
property of tablet	Hardness (kg)		14	15	14	11
	Friction loss (%)		0.2	0.3	0.2	0.3
	Disintegration time (min)		6	7	8	8

#### 4. Test Protocol

- 1) Test machine  
 SPIRA-A-FLOW MINI (FREUND Industries Co.,)
- 2) Test material  
 Corn starch : Corn starch W (Nihon shokuhin kako Co.,)  
 Lactose : Pharmatose 200mesh (DMV)  
 HPC : NISSO HPC-SSL, SL, L
- 3) Condition of granule preparation
  - (1) Powder charge 1000g
  - (2) Method of adding binder...Spray system
  - (3) Operating condition
    - Spray nozzle : ATU-MINI
    - Spray pressure : 1.0kg/cm<sup>2</sup>
    - Spray air quantity : 331/min
    - Liquid charge speed : 12ml/min (standard)
    - Rotar speed : 300rpm
    - Supply air temp. : 80°C
    - Air quantity : 0.7~0.8m<sup>3</sup>/min
    - Drying : Temperature of granule increase until 50°C
- 4) Measurement
  - (1) Particle size distribution  
 Apparatus : Ro-Tap Type SIEVE SHAKER (HEIKO SEISAKUSHO LTD.)  
 Sieve : No.12(1400μ)、No.30(500μ)、No.42(355μ)、  
 No.60(250μ)、No.83(180μ)、No.100(150μ)、  
 No.140(106μ)、No.200(75μ)、diameter 20cm  
 Condition : Shaking times...about 290 times/min,  
 Hitting times...about 160 times/min,  
 Shaking range...about 3cm、Times...5min,  
 Sample weight...50g
  - (2) Angle of repose, Bulk density  
 POWDER TESTER TYPE PT-D (HOSOKAWAMIKURON)

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