

## MSB OFFSET MIXING SYSTEM

Unlike standard systems this mixing ink system is made of concentrates which are not ready to print. Active ingredients like antioxidants and drying catalysts need to be added to achieve a finished ink. These ingredients have a significant influence on the physical and lithographic behaviour of the final printing ink. It is in the full responsibility of the user to add the extra-components in the right quantities. Sun Chemical cannot assume any liability on the printing performance of MSB blended printing inks.

This document describes the MSB system and gives formulation guidance for the different applications, prepared on the best of our knowledge, but in any case the results cannot be guaranteed as the conditions of application can vary.

### CHARACTERISTICS

The MSB blending scheme provides a system for ink blending to meet the needs of a wide range of applications and end-uses through mixing in our own facilities or at colour stations.

The MSB blending scheme consists of:

- A range of 29 MSB bases, in standard, high resistance and some PANTONE®<sup>(1)</sup> colours which are
  - mineral oil free (vegetable based)
  - mono-pigmented
  - wax and drier free
  - rheologically balanced
- Transparent extenders and opaque white.
- A "Pastel White", specifically developed to make pastel shades, with reduced yellowing.
- 6 additional "Special Bases", based on high performance pigments, designed for special application (security inks, outdoor posters, ...).
- An agreed list of additives and technology varnishes.

The **MSB** system has been enhanced by:

- Addition of various extender media to allow formulation cost reduction and improved product performance.
- Rationalisation of the additive range while offering maximum formulation flexibility.
- Inclusion of inks for special applications such as Heatset, Coldset and foils printing.

### FUNCTION AND USE

- By following the guidelines in this leaflet the system can be used to provide inks for:
  - **Pantone** blended colours and bases for a wide variety of applications, Sheetfed, Heatset and Coldset.
  - **spot, special or brand colours** in a number of profiles covering a wide colour gamut :
    - spot colours matched "on demand"
    - Pantone colours with special resistances or intensities
    - special colours for particular end uses e.g. post impression laser printing, blister packs etc.
    - colours for cast coated cartons (as Chromolux) and other low absorbency substrates.
  - **printed packaging** with particular end use requirements:
    - -light fastness
    - -product resistance
    - -varnishing and lamination
- **4-colour process** printing with special requirements not met by standard 4-colour process series e.g.
  - -Blister packs
  - -Cast coated cartons or other low absorbency substrates
  - -special resistances or intensities
- **multi colour (6 or more) process** printing
- **Exclusion of food packaging**  
Spot colours from MS bases are supposed to react with oxygen. By-products of this reaction may be odorous making blends for sensitive packaging (food, tobacco) unsuitable. **The use of SunPak® FSP or SunPak® LMQ is recommended instead.**



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### FORMULATION GUIDELINES

The components of the **MSB** system listed in **Table 1** and **Table 2** can be used to blend colours at commercial colour strengths to meet different printing and end-use requirements.

Different formulation methods can be employed to balance the needs of formulating flexibility with reduced formulation cost and material handling. These are given in **Table 3** from individual additives giving maximum formulation flexibility and allowing the greatest number of profiles, or using **AD210 drier free composite varnish** allowing reduction in material handling.

### LITHOGRAPHIC PRODUCT PROFILES

Formulations from **MSB** bases and additives have been selected to give finished inks with robust lithographic performance and profiles adapted to specific areas in sheetfed printing:

#### Sheetfed ST

The standard sheetfed formulation contains standard additive levels. The resulting profile is adapted for general sheetfed printing in the commercial and packaging markets.

Where a higher productivity profile is required, addition of up to 2% **AD320** will give improved non-setoff and fast work and turn properties, but with a small risk of piling under difficult conditions.

#### Sheetfed CT

The profile for rotary business form printing with extended duct stability achieved through addition of anti-oxidant and minimum drier levels. For printing on chemical carbonless copy paper in business form printing the use of blends resistant to alkali and to nitro-cellulose varnish is recommended. Resistant inks should also be used in pre-printing work that will be second impression non-impact printed under difficult conditions.

#### Sheetfed BL

A wax free profile for prints to be subsequently heat-sealed with blister packaging.

Since there are many factors that can affect the final result with this type of work (substrate, sealing conditions, blister material etc.), a printing trial is always recommended. **Sheetfed BL** is also recommended for work to be laminated and UV varnished where standard inks do not give satisfactory results.

#### Sheetfed HR

A profile with hard drying and improved rub resistance for printing Chromolux and other low absorbent papers.

**Sheetfed HR** can also be used on matt coated papers where additional mechanical resistance is required over **Sheetfed ST**.

The improved drying and mechanical resistance properties of **Sheetfed HR** are achieved through increased quantities of selected waxes and driers resulting in:

- very limited fresh effect, necessitating wash up of ducts and inking rollers at the end of the print run,
- limited varnishability: **Sheetfed HR** is not normally recommended for UV varnishing or lamination. Where varnishing is envisaged for example in-line using a water-based varnish, tests or a printing trial should be completed on the actual substrate to be used.

**Sheetfed HR** can be replaced by **Sheetfed FO** formulas when excellent drying properties are requested (difficult substrates,...).

#### Sheetfed TNE

Based on the new Titan technology, **Sheetfed TNE** is designed for printers who look for fast work and turn and quick converting properties. The addition of AD260 will provide excellent rub resistance very quickly after printing without reducing the freshness of the ink. This profile is recommended for all kind of absorbent papers but should not be tried on low or even non-absorbent papers. For those kinds of papers **Sheetfed FO** should be preferred.



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### Sheetfed FO

By addition of the **Foils Additive AD240**, the **MSB** bases can be used on non-porous substrates and foils.

The improved drying and mechanical resistance properties of **Sheetfed FO** are achieved through the addition of **AD240**, a mixture of a hard drying varnish and selected waxes, together with higher level of driers, resulting in (same as **Sheetfed HR**):

- not duct fresh.
- limited varnishability and lamination.

Preliminary testing is recommended for the following substrates:

- Polyethylene, polypropylene, and PE coated board, PVC
- Woven polyolefins such as Tyvec and Syntape,
- Polyesters and -acetates,
- Metallised substrates.

### Heatset inks

**Heatset** spot colours can be made from **MSB** bases, up to 70 % of colour bases, together with **Heatset Additive AD220**. This additive contains a fast evaporating and setting varnish, a heatset type wax and some tack reducer, to give the heat-setting properties to the finished ink.

### Coldset inks

**Coldset** spot colours can be made from **MSB** bases, up to 75 % of colour bases, together with **Coldset Additive AD230**. This additive contains coldset varnish, extenders and additives, to adjust viscosity and tack of the finished ink.

### FASTNESS AND RESISTANCE REQUIREMENTS

During its lifetime, a print might change its colour. Light fastness and resistance parameters describe the ability of the print to maintain the colour under the conditions of its application. The product table (see page 5 of this document) contains those parameters, evaluated using test methods agreed in international standards.

The parameters of the pure base inks are different to those of a blended spot colour. As a general rule, it is the base ink with the lowest resistance that defines the overall fastness/resistance value. Higher pigmented inks are usually more persistent, the resistance is reduced the more the strength of the shade is reduced. Resistance levels can also vary in practice caused by a number of factors as pigment compositions, substrate, colour strength, film weight used, the printed picture (solids, screened half-tones), storage conditions, exposure time etc.

For each **MSB** base the expected resistances of a finished ink formulated using that base only are noted in **Table 1**.

### Light fastness

Light fastness is important where prints are exposed to sunlight. Inks for outdoor poster application should reach at least a light fastness of WS 6 (and should be alkali resistant because of the potential use of alkaline glue).

The light fastness of inks for packaging should be adapted to the intended use. Packaging which are supposed to be stored close to a window should have a light fastness of not lower than WS 5.

Light fastness (ISO 12040) has been determined at 100 %, 10%, and 2% concentrations of the particular **MSB** base using the Blue Wool Scale. By calculating the percentage of pigment in each blend, an estimate of the approximate light fastness can be made.

### Chemical resistances

Resistance properties play a role when the prints are processed (coating, foil-laminating), or when the prints are exposed to chemicals, e.g. detergents. Water-based overprint varnishes may contain solvents or high percentages of ammonia, which can require the resistance against alkaline and alcohol. A test under industrial conditions is advised.

UV coatings contain monomers which might have an impact on the print. Often alkaline, alcohol and solvent resistance are demanded. A test under industrial conditions is recommended.



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The figures given for chemical resistance can also be used to estimate the resistance of blends. If the blend contains a base not being resistant to alkali or to solvent mix, then the blend is not resistant.

Resistance to alkali (ISO 2836) can be used to assess resistance to alkaline products. However, additional specific tests may be necessary (i.e. specific product resistance test).

While in many cases satisfactory results are obtained with **Sun Chemical** water based and UV varnish products without special precautions, varnish products vary widely in their composition and prior testing is recommended where non-resistant colours are used.

### HANDLING

**MSB** bases are stable without skinning for extended periods. Where skin has formed over prolonged storage, for example through low usage, this should be carefully removed prior to use.

Blends should be mixed thoroughly to ensure complete homogenisation with low viscosity components.

Inks blended from the **MSB** system can be potted directly, although removal of air by vacuum is recommended, and the use of vacuum packaging will give extended shelf life.

### QUALITY CONTROL

**MSB** bases are carefully controlled for rheology, fineness of grind, strength and colour shade by spectrophotometer to ensure the best possible consistency.

<sup>(1)</sup> PANTONE ® and other Pantone, Inc. trademarks are the property of Pantone Inc.



**The bases are divided in three groups:**

**-Group 1 – The Basic ones:** These bases are well covering the colour space with non-resistant and resistant pigments, and should meet more than 90% of the standard colour matching requests. Every colour matching centre should have these bases as standard.

**-Group 2 – The Optional ones:** Good to have some of them to improve capability to match specific shades, but not a must.

**-Group 3 – The Special ones:** Based on very resistant pigments, in consequence relatively expensive, they must be reserved to specific highly demanding applications.

**Table 1: MSB bases – Technical information**

Code	Colour	Light fastness ISO12040			Alcohol ISO 2836	Solvent mixture ISO 2836	Alkali ISO 2836
		100%	10%	2%			
<b>Group 1 : THE BASIC ONES</b>							
MSB12	Yellow	6/7	5	4	+	-	+
MSB18	Yellow	5	3	2	+	+	+
MSB21	Orange	5	4	3	+	+	+
MSB31	Warm Red	3	2	1	-	-	-
MSB33	Red	5	4	4	-	-	+
MSB36	Red	6	5	4	+	+	+
MSB42	Rubine	5	4	4	+	+	-
MSB54	Resistant Pink	7	7	6/7	+	+	+
MSB53	Violet	7	6	5	+	+	+
MSB61	Reflex Blue	3	2	2	-	-	+
MSB17	Blue	8	7	6/7	+	+	+
MSB71	Green	8	7	6/7	+	+	+
MSB50	Black	8	8	7	+	+	+
MSB45	Opaque white						
MSB48	Transp. White						
<b>Group 2 : THE OPTIONAL ONES</b>							
MSB11	Yellow	7	6	5	-	-	+
MSB13	Yellow	5	4	4	+	+	+
MSB15	Yellow	5/6	4	3	+	+	+
MSB06	Orange	4	3	2	+	+	+
MSB23	Warm Red	3	2	1	-	-	-
MSB32	Red 032	6	5	5	+	-	+
MSB34	Red	3	2	2	+	-	+
MSB40	Red	4	3	2	+	+	+
MSB35	Rubine	5	4	3	+	+	-
MSB55	Rhodamine Red	4	3	2	-	-	-
MSB51	Purple	4	3	2	-	-	-
MSB52	Violet	4	3	2	-	-	-
MSB60	Blue	4	3	2	-	-	-
MSB65	Reflex Blue	3	2	2	-	-	+
MSB16	Blue	8	7	6/7	+	+	+
MSB47	Pastel White						
<b>Group 3 : THE SPECIAL ONES</b>							
MSB10	Yellow	7	7	6/7	+	+	+
MSB19	Warm Yellow	6	5/6	5	+	+	+
MSB07	Orange	6/7	6/7	6	+	+	+
MSB22	Red	7	7	6/7	+	+	+
MSB37	Carmine	6/7	5	5	+	+	+



**Table 2: MSB Additives**

Code	Type	Description and recommendations for use
AD110	Sheetfed varnish	Standard letdown varnish for optimum lithographic properties. To be used in all recipes containing more than 50% of MSB bases, instead of Transparent White MSB48 to save costs.
AD210	Sheetfed composite varnish	Technologic composite varnish to be used at 16-18%; containing varnish, wax and anti-setoff. It gives standard intensity inks with sufficient mechanical resistance for most applications and especially suitable for finishing processes such as off-line UV varnishing. Adapted rheology should minimise the necessity to use additional additives to adjust tack and viscosity.
AD220	Heatset composite varnish	Varnish compound for the formulation of inks with rheology, press stability and drying adapted for heatset printing.
AD230	Coldset composite varnish	Varnish compound for the formulation of inks with rheology, press stability and drying adapted for coldset printing.
AD240	Foils composite varnish	Varnish compound for the formulation of inks having fast drying properties for Chromolux and impervious substrates (films and foils).
AD250	Foils paste	Paste to be added at 10-15% to improve drying of conventional inks for foils application.
AD260	Titan composite varnish	Composite varnish based on the Titan technology and containing also varnish, wax and anti-set off which will provide a very quick drying on all absorbent papers without reducing the freshness of the ink. Designed for printers who want to increase their productivity by reducing their waiting times.
AD310	Perfecting additive	Additive for use in perfecting inks to prevent impression cylinder piling. Can also be used in coldset inks.
AD320	Anti set off additive	Additive giving a higher productivity profile through improved non-set set off and fast work and turn properties, but with a higher risk of piling.
AD330	Anti-slip additive	Additive to be used (5 to 15%) in order to reduce slip of inks and overprint varnishes.
AD410	Linseed oil	Viscosity and tack reducer, also giving improved tack stability where using lower quality papers, perfecting, and in business form printing.
AD420	Tack off	Gelled tack reducer which will retain ink setting properties.
AD510	PE wax paste	Standard polyethylene based wax additive for the mechanical resistance of the dried ink film.
AD520	PTFE wax paste	PTFE wax additive giving improved mechanical resistance. May be omitted for improved finishing properties, for example when off-line UV varnishing or laminating.
AD810	Anti-oxidant compound	Additive to avoid skin formation on the rollers or in the ink duct (fresh effect). Necessary for business forms applications and other specific requests
AD910	Standard drier	Standard drier blend giving surface and through drying adapted for most applications.
AD940	High performance drier	High reactivity surface drier giving faster drying and improved mechanical resistance to the dried ink film, but with limited ink stability in the duct (reduced fresh effect).



**Table 3 : Finished ink formulations from MSB bases, additives and composites varnishes**

Code	Description	ST		CT		BL	HR		FO		TNE	H/S	C/S
		Option 1	Option 2	Option 1	Option 2		Option 1	Option 2	Option 1	Option 2			
<b>MSB base</b>	Pigmented concentrates	Max 95 Stand. 80	Stand. 80	Max 93 Stand. 80	Stand. 80	Max 99	Max 92	Stand. 78	Max75	Max 75	Max 80	Max 70	Max 75
<b>MSB48</b>	Transparent White	Balance	Balance	Balance	Balance	Minimum	Balance	Balance	Balance	Balance	Balance		
<b>AD210</b>	Sheetfed composite varnish		18		15			18			0 - 10		
<b>AD110</b>	Let down Varnish	0 - 30	0 - 30	0 - 30	0 - 30	Minimum	0-30	0 - 30		0 - 30	0 - 5		
<b>AD240</b>	Hard drying additive								20				
<b>AD250</b>	Foils paste									10 - 15			
<b>AD260</b>	Titan composite varnish										10 - 20		
<b>AD310</b>	Perfecting additive												0 - 5
<b>AD230</b>	Coldset additive												25 - 60
<b>AD220</b>	Heatset additive											30 - 40	
<b>AD510</b>	PE Wax additive	3		3			3			3			
<b>AD520</b>	PTFE Wax additive	(1)		(1)			2	1		2			
<b>AD910</b>	Standard Drier	2	2	1	1	1	2	2	2	2	2		
<b>AD940</b>	High Performance Drier						1	1	3	3			
<b>AD810</b>	Anti-oxidant	(0.5)		1	1								
<b>AD410</b>	Linseed oil	(0 - 2)	(0 - 2)	3	3	(0 - 2)	(0 - 2)	(0 - 2)	(0 - 2)	(0 - 2)	(0 - 2)		
<b>AD420</b>	Tack off 7000	(0 - 3)	(0 - 3)			(0 - 3)							
<b>AD320</b>	Anti set off additive	(0 - 2)	(0 - 2)										
	<b>Total</b>	100 %	100 %	100 %	100 %	100 %	100%	100 %	100 %	100 %	100 %	100 %	100 %

Quantities in brackets ( ) indicate optional additives.

Notes:

The balanced viscosities and tacks of AD210 and AD110 normally allow formulation of inks adapted for sheetfed printing on standard substrate grades without addition of reducing additive AD410.

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