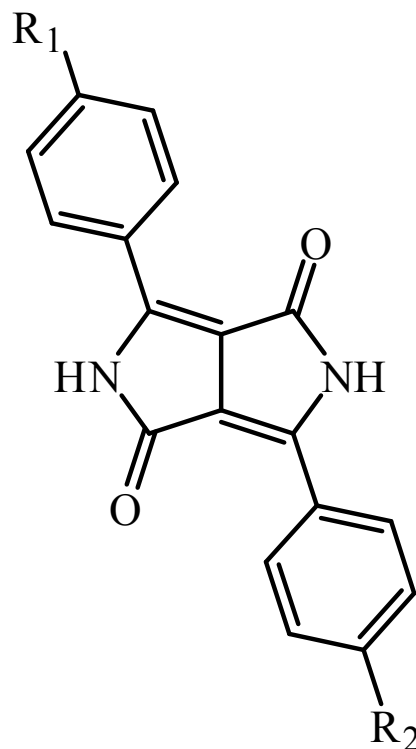


MCA DPP Pigments Technology

MCA Technologies GmbH (Switzerland), November 12, 2006

Supporting R&D & Business Development
in Life Sciences and Specialty Chemicals Industries

MCA DPP Pigments Technology



MCA® **RED** (economical)/**GREEN** (ecological) DPP Technology
(Patented world-wide, including India & China)

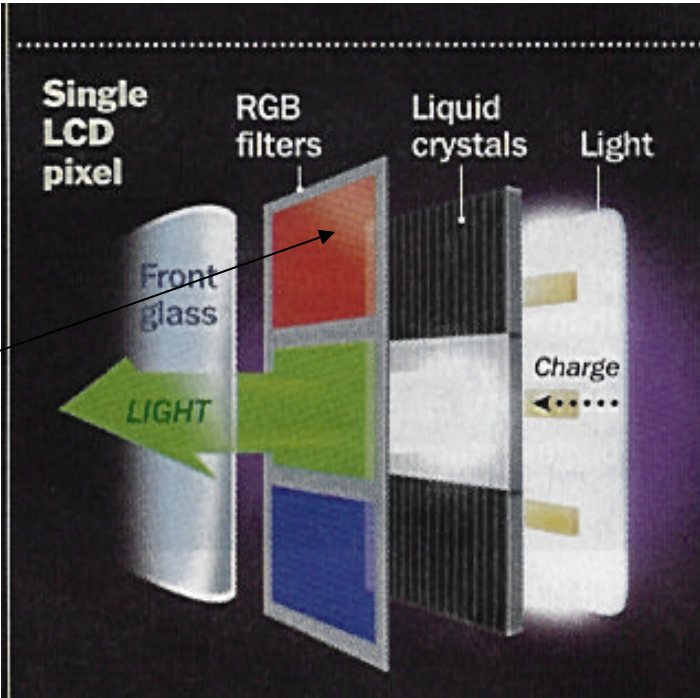
Priorities

- Electronics: Colour filters for flat screens (nano particles)
- High performance printing inks: Digital printing (nano particles)
- Plastics: High value-in-use (transparent/easy dispersible)
- High-performance industrial paints: Tinting systems
- Automotive: Opaque

Increasing particle sizes



DPP Pigments in Electronics



DPP

DPP Pigments in Paints (Red 2030)



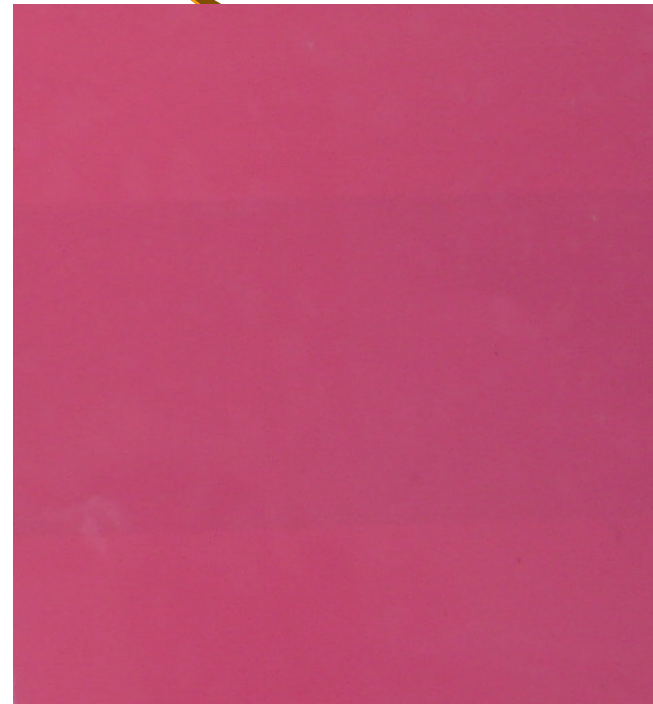
Standard DPP Red 2030 | MCA® DPP Red 2030

(Masstone)

DL: 0.43

DC:0.47

DE:0.68



Standard DPP Red 2030 | MCA® DPP Red 2030

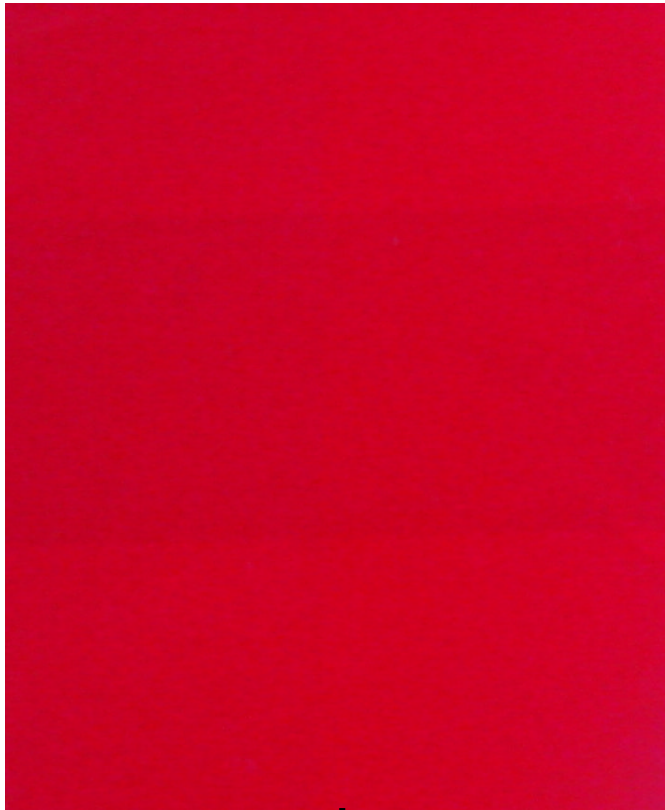
(White Reduction)

DL: 0.46

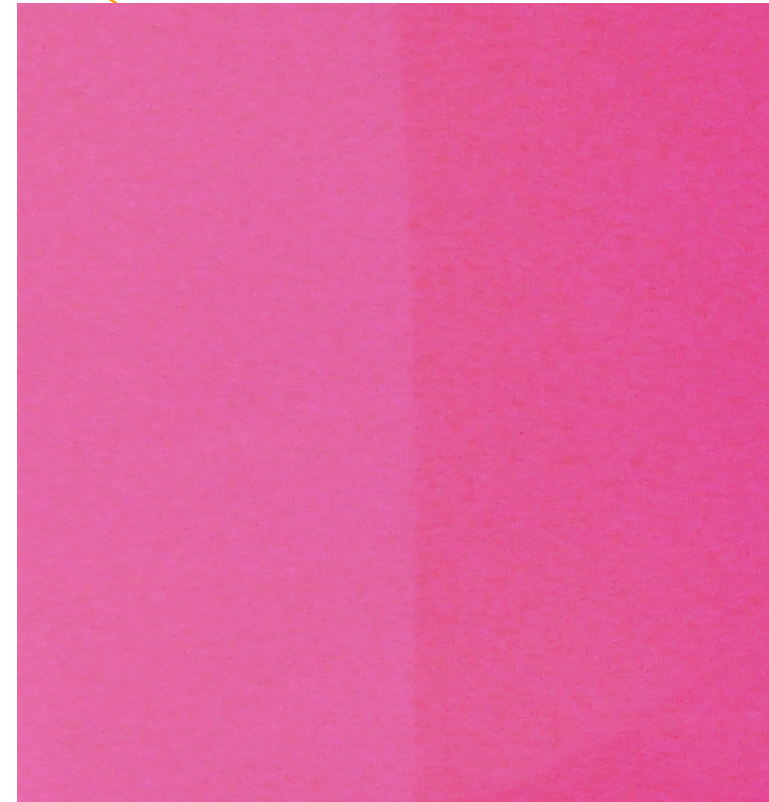
DC:-0.60

DE: 0.8

DPP Pigments in Paints (Red BO)



Standard DPP Red BO | MCA® DPP Red BO
(Masstone)
DL: 0.41
DC:1.11
DE:1.31



Standard DPP Red BO | MCA® DPP Red BO
(White Reduction)
DL: - 1.01
DC: 2.16
DE: 2.39

MCA DPP Pigments - Properties



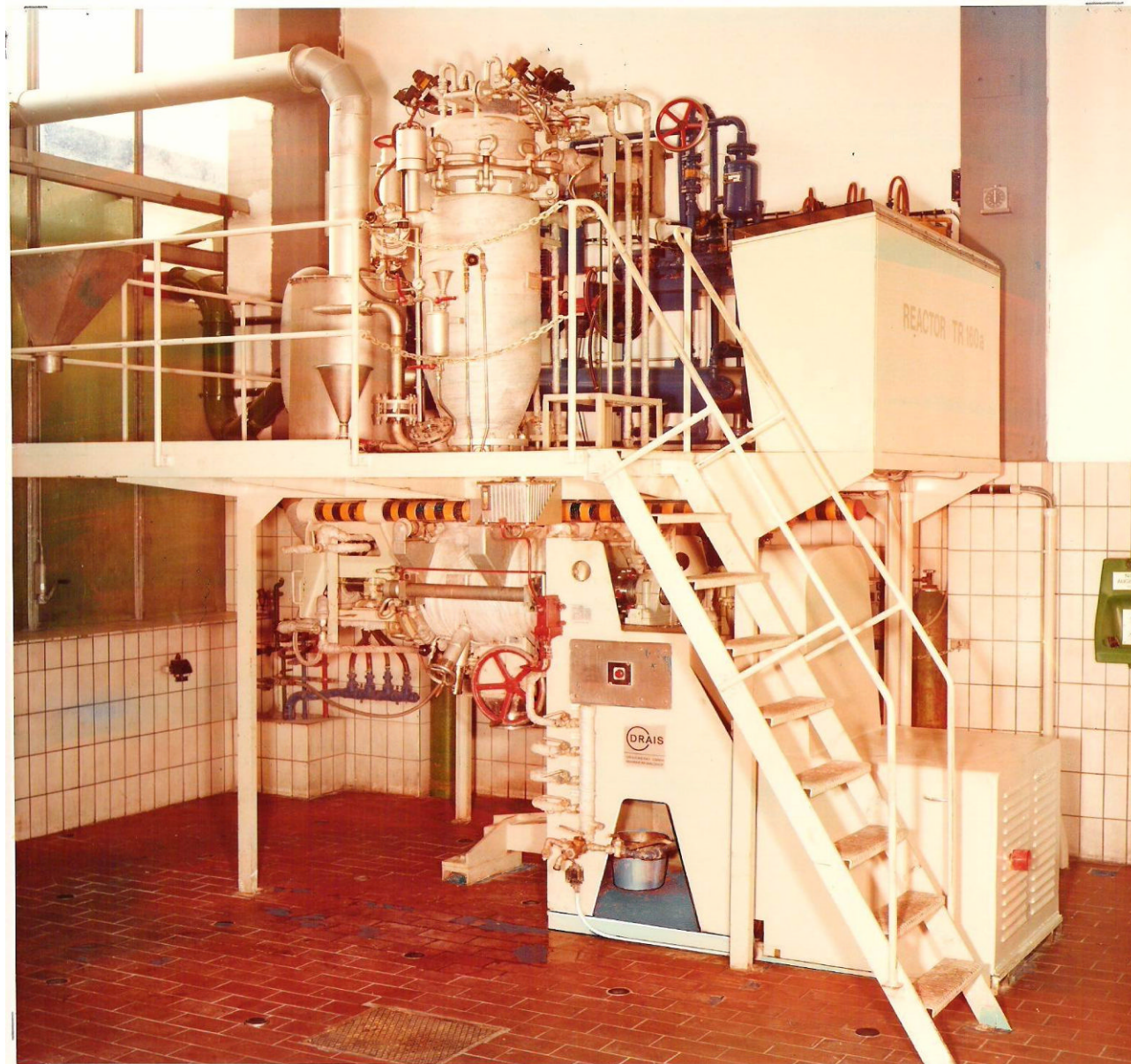
Density	1.61 g/ml
Specific Surface Area	16
Average Particle Size	3.05 µm
Colour Strength: Flexible PVC 1% TiO ₂ , 1/3 SD Polyethylen 1% TiO ₂ , 1/3 SD	0.22 % Pigment 0.27% Pigment
Migration: Flexible PVC 0.2% Pigment	5
Heat Stability (200 C): PVC White Reduction PVC 0.2%	5 5
Light Fastness: PVC White Reduction PVC 0.2%	8 8
Weather Fastness (1500 hours): PVC White Reduction PVC 0.2%	5 5
Chemical Resistance (Paints): Acids (HCl/H ₂ SO ₄) Bases(NaOH)	5 5
Solvent Resistance: Xylene Methyl ethyl ketone Ethyl alcohol	5 4-5 4-5

MCA[®] DPP Red BO

Density	1.56 g/ml
Specific Surface Area	26
Average Particle Size	2.9 µm
Colour Strength: Flexible PVC 1% TiO ₂ , 1/3 SD Polyethylen 1% TiO ₂ , 1/3 SD	0.148 % Pigment 0.182% Pigment
Migration: Flexible PVC 0.2% Pigment	5
Heat Stability (200 C): PVC White Reduction PVC 0.2%	5 5
Light Fastness: PVC White Reduction PVC 0.2%	8 8
Weather Fastness (1500 hours): PVC White Reduction PVC 0.2%	3-4 5
Chemical Resistance (Paints): Acids (HCl/H ₂ SO ₄) Bases(NaOH)	5 5
Solvent Resistance: Xylene Methyl ethyl ketone Ethyl alcohol	5 4-5 4-5

MCA[®] DPP Red 2030

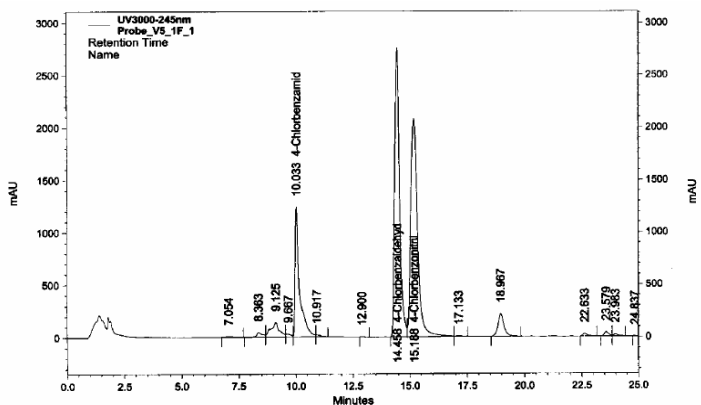
Pilot Plant in Germany



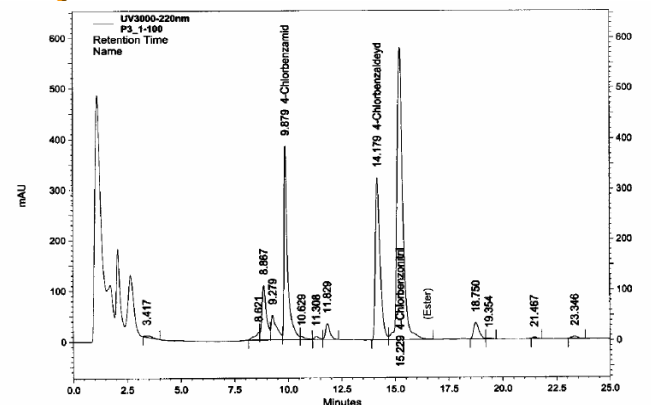
Pilot Plant in Korea



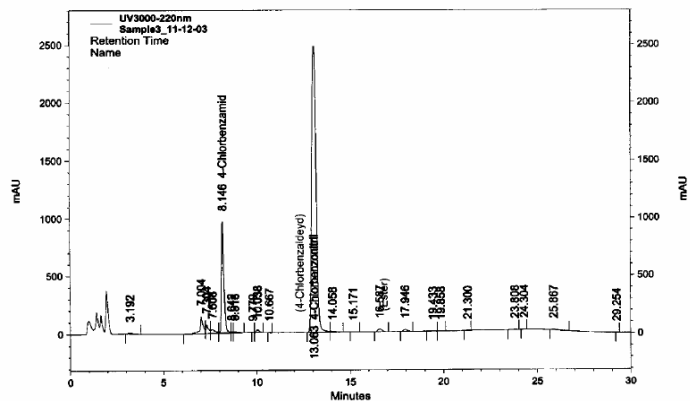
Continuos Process Improvement



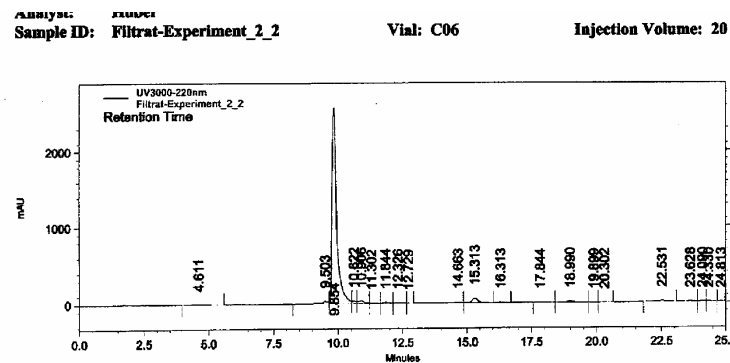
HPLC V5 1F 13.08.03



HPLC Sample-3 03.10.03

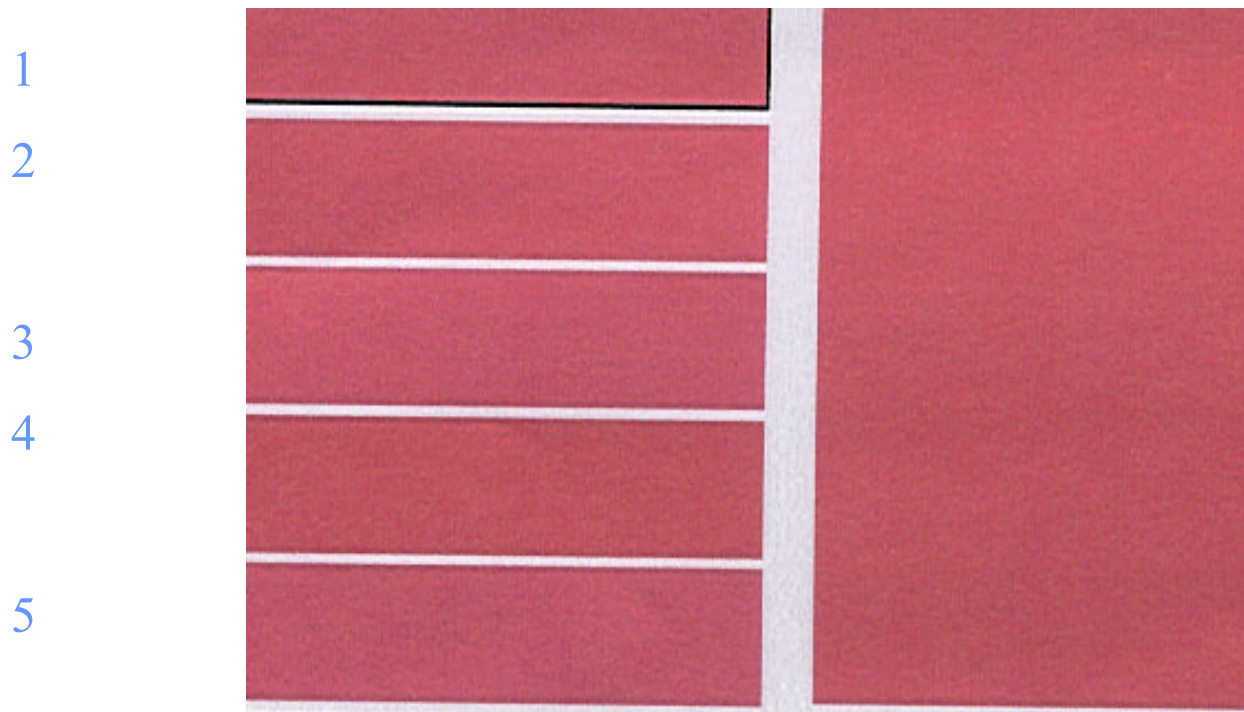


HPLC Sample-3 11.12.03



HPLC Expt.2 Sample-3/ 14.04.04

Highly Reproducible



Experiments

Standard

Improving Manufacturing Costs – Material

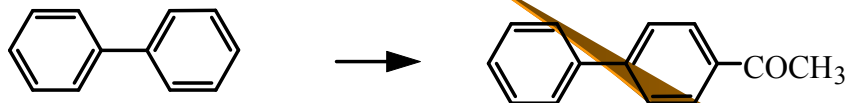


Strategic Sourcing of Raw Materials

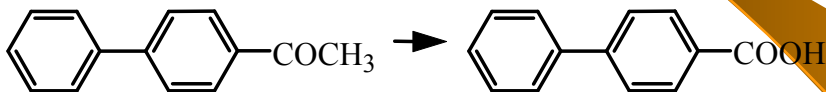
- Sources of new base (Europe, India, China)
- Sources of alternative commodity solvent (world-wide)
- New alternative sources (Europe, India and China) of dialkyl succinate
- New alternative sources (Europe, India, China) of p-chlorobenzonitrile and p-tolunitrile
- New synthesis (!) and sources (Europe, India) of cyanobiphenyl

Cyanobiphenyl

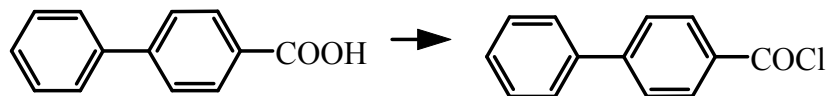
1) Fridel Kraft



2) Oxidation



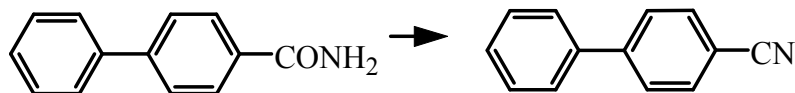
3) Chlorination



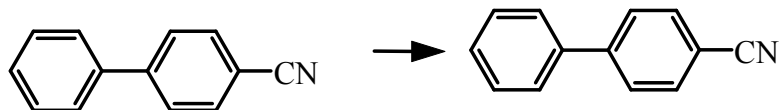
4) Amidation



5) Dehydration



6) Purification/Distillation



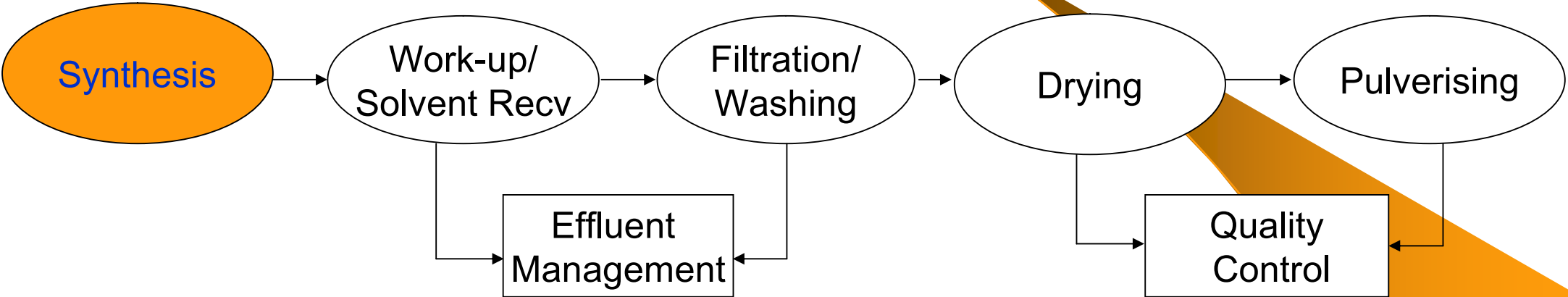
99.7%

- Confidential -

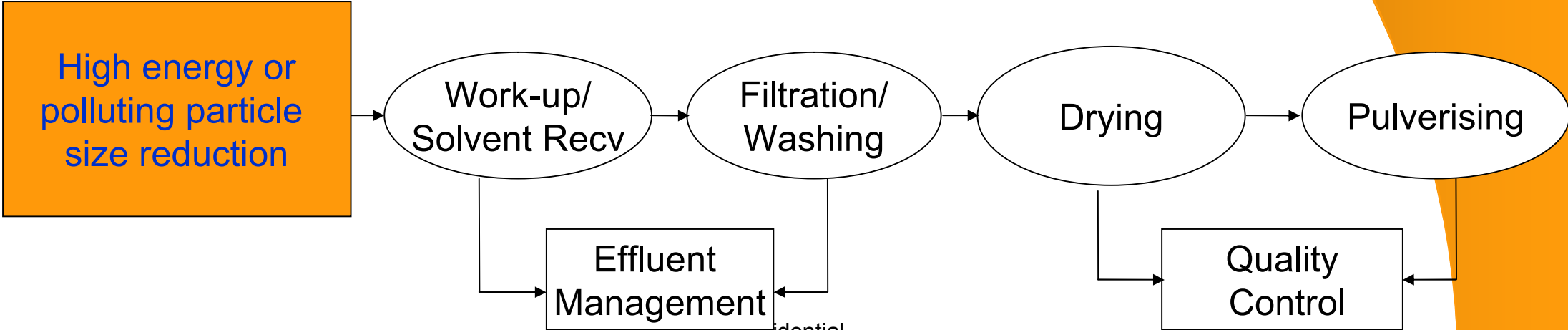
Manufacturing Process and Economy of Phthalocyanine Blue Pigments



Crude USD 2.5-3.0/kg



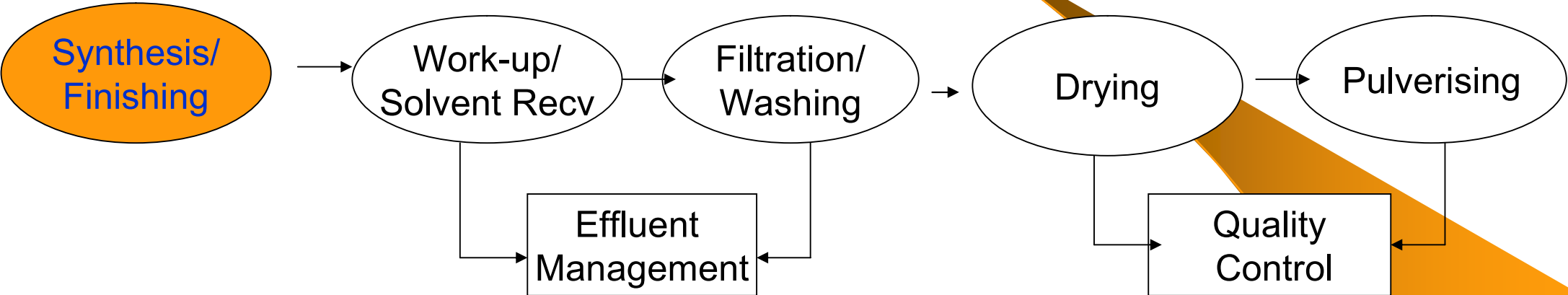
Finished Pigment USD 5-10/Kg



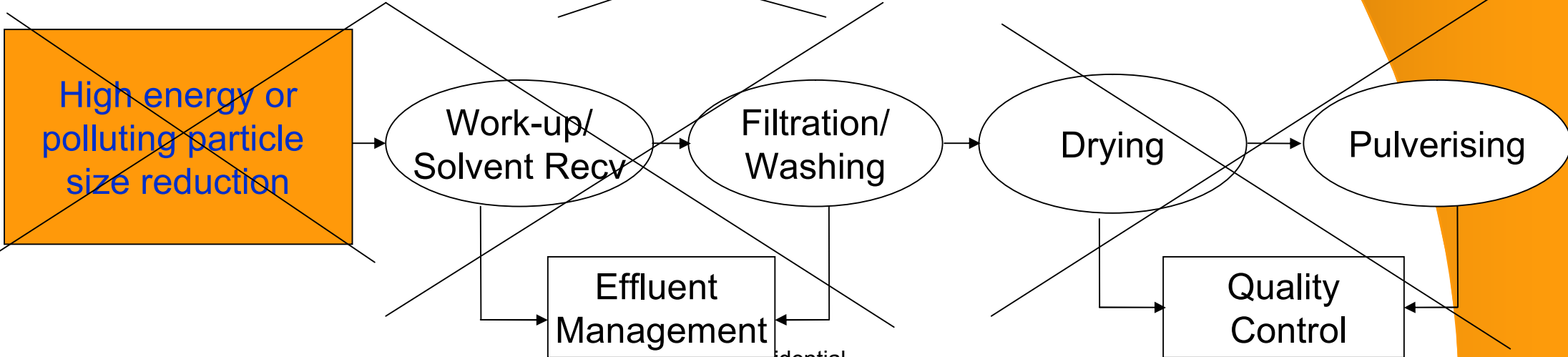
MCA DPP Pigments Technology: Process Optimization (Faster, Cleaner, Cheaper)



Crude + Finishing



~~Finished Pigment~~



MCA DPP Pigments Technology vs. Micro-Reactor Technologies



Micro-reactor processes: Essentially “top- & bottomless” i.e. they do not solve the problem of the most essential “work-up” part of chemical/biochemical processes¹

¹ United States Patent 6,566,519 Nickel, et al. May 20, 2003

MCA Technologies GmbH (Switzerland)

Dr. B. L. Kaul, CEO

Supporting R&D and Business Development Chain in
Life Sciences & Specialty Chemicals Industries

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