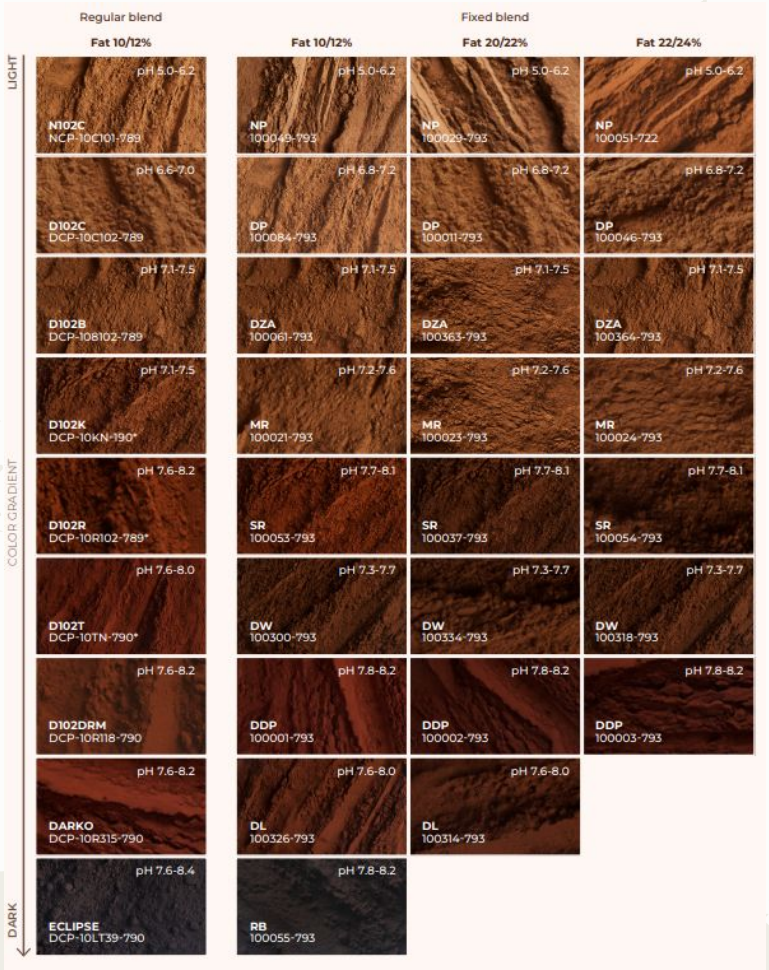
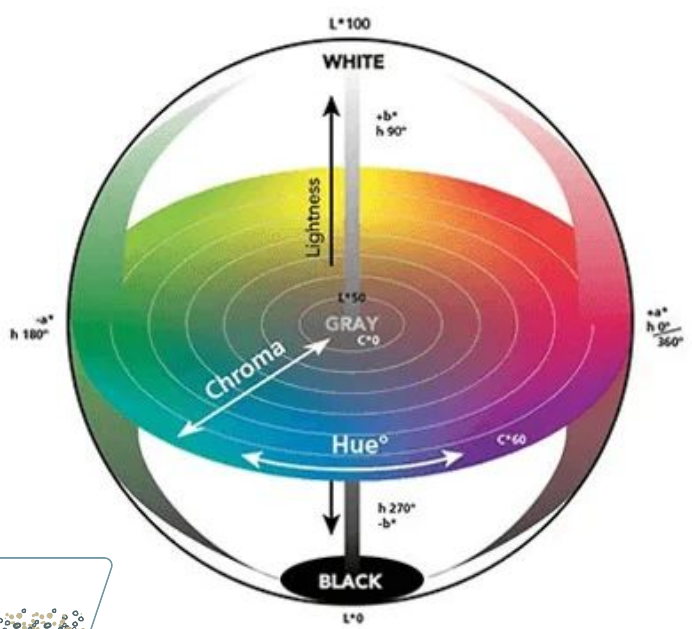
Create a color predictive tool for **applications** and **cocoa** raw material

November 2024 - Frédérique Rautureau - Cocoa Application lab Louviers

LCH Color system





- L* Lightness
- C* Saturation
- H° Hue

Alkalization

Create a color predictive tool

WHY ?

Save time and improve the accuracy of our response to customers in the following activities :

- Predicting the cocoa blends that answers a customer request faster and better (more accurate)
- Supporting customer R&D team in their advice to customer
- Supporting us in cost savings studies (eg. predict powder % reduction with a more alkalized ref)

WHAT ?

- Create a digital colour predictive tool for applications (starting with Beverages and compounds)
- Generate a database of colour in applications

HOW ?

Run a Design of Experiment (DoE) to modelize the impact of each component powders at different % on color/taste.

Compliment with analysis performed on a daily basis in the lab

DOEs proved the model is working

We have 2 separate models for these applications

For beverages

DOE performed at 1%, 2% and 3% with 13 different cocoa powders

For compounds & fillings

DOE performed at 11%, 16% and 21% with 6 different cocoa powders

L*compound = 10.5569+0.7272 x L*powder - 47.85 x %powder
C°compound = 6.419566277+0.8666008124 x C° powder -34.191966667 x powder%
H*compound = 115.751887269-0.163575238 x C* powder +0.9210985783x H* powder-49.3 x powder%

The dream tool: 3 interphases

Lab data on application

In this interphase, all lab technicians would enter their application data to feed the algorithm:

Date of measurement, Product type, Recipe code, Cocoa lot #, cocoa %, SF Item #, application color values measured (LCH)

This information is stored in a raw data file linked to JMP to refine algorithm on specific timings

Raw material data

This interphase is connected to SAP and our competitor database to obtain QA measurement and pricing estimation on raw material

SAP info to retrieve:
QA data: Raw material color (LCH), pH, specifications low and high ranges,
Sales data: price indication in real time

Customer solution

This interphase is a tool for customer support to advice the best cocoa ingredient.

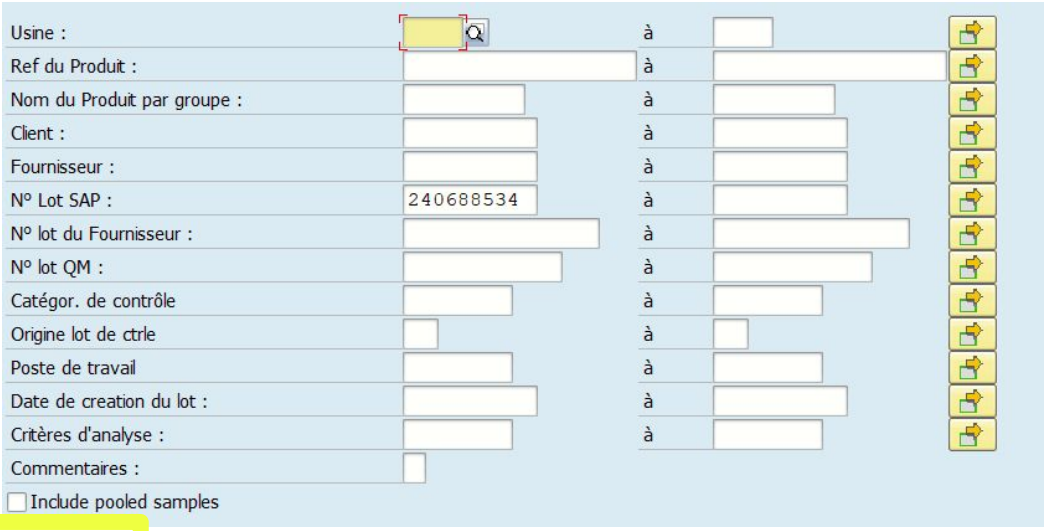
Start from raw material color (competitor matching) to assess best match from our portfolio, it will predict the colour in application when selecting a specific product type

Start from application color (when customer doesn't want to share competitor sample, to assess market products)

Obtain **alternative** options for **cost reduction or recipe optimisation**, indicating by color coding if the alternative has been performed, is extrapolated from existing trials or just purely theoretically calculated from the algorithm (helping with risk analysis and justifying for the lab to run DOEs on specific applications or raw materials to complete the data set)

This model is currently done on cocoa powders, but could be extended to cocoa liquors and chocolate

SAP: Z1036 with **lot #**
Obj: get QA data



Article	Désignation article
DCP-10C102-789	BC D102C 25KG/SAC 30SAC/P
DCP-10C102-789	BC D102C 25KG/SAC 30SAC/P
DCP-10C102-789	BC D102C 25KG/SAC 30SAC/P
DCP-10C102-789	BC D102C 25KG/SAC 30SAC/P
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DCP-10C102-789	BC D102C 25KG/SAC 30SAC/P
DCP-10C102-789	BC D102C 25KG/SAC 30SAC/P

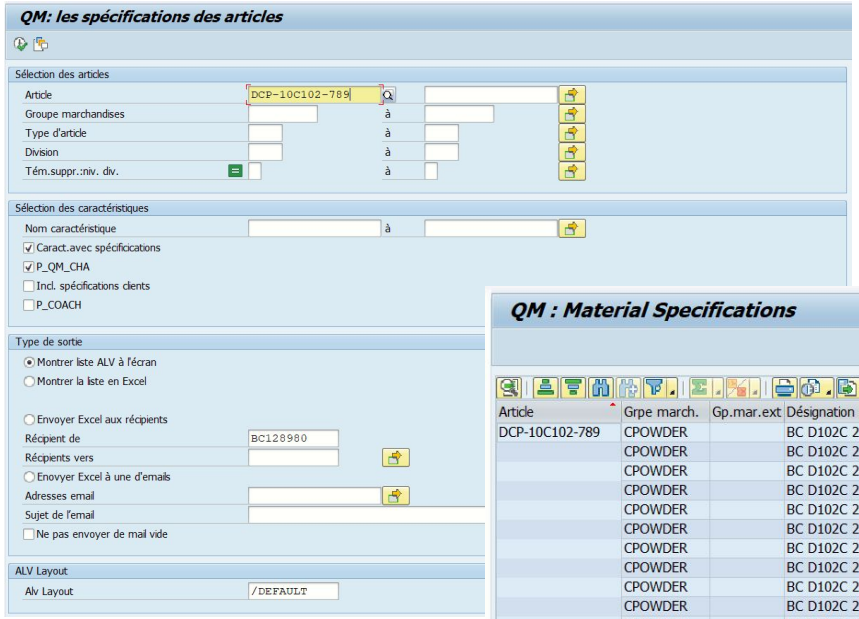
M001-04	M001-04	M001-05	M001-05	M002-02	M002-02	M003-09	M003-09
Matière grasse total	Matière grasse total	Matière grasse total	Matière grasse total	Humidité	Humidité	Finesse sur tamis <7	Finesse sur tamis <7
OPTIONAL	CHEM_FYS	OPTIONAL	CHEM_FYS	OPTIONAL	CHEM_FYS	OPTIONAL	CHEM_FYS
			10.80		1.93		99.62
	10.57		10.82		2.25		99.62
		10.80		2.25		99.62	
10.60			10.80		2.25		99.62
10.60			10.80		2.25		99.62
		10.80		2.25		99.62	
10.60			10.80		2.25		99.62

M005-31	M005-32	M005-33	M005-34	M005-35	M005-36	M005-37	M005-38	M006-01	M006-01
L* (Q)	a* (Q)	b* (Q)	H* (Q)	L* interne (calc)	a* interne (calc)	b* interne (calc)	C* (Q)	pH	pH
CHEM_FYS	CHEM_FYS	CHEM_FYS	CHEM_FYS	CHEM_FYS	CHEM_FYS	CHEM_FYS	CHEM_FYS	OPTIONAL	CHEM_FYS
26.71	16.00	18.94	49.81	26.06	15.39	18.02	24.79		5.45
								5.50	
									5.50
									5.50
								5.50	
									5.50

R001-05	R002-02	R003-09
R - Matière grasse t	R - Humidité	R - Finesse sur tami
CHEM_FYS	CHEM_FYS	CHEM_FYS
10.82	2.25	99.62

SAP: ZMATSPEC with **Article code**

Obj: get specs range



QM : Material Specifications

Article	Grpe march.	Gp.mar.ext	Désignation article	Caractér.	Désignation caract.	M Spec		OP Spec	spec kunde		R Spec	Nom 1	Art.client	Div.	Client
DCP-10C102-789	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	001-05	Matière grasse totale sur sec	10,0 - 12,0 %					9,5 - 12,5 %				
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	002-02	Humidité	0,00 - 5,00 %					0,00 - 6,50 %				
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	003-09	Résidus finesse à l'eau	99,50 - 100,00 %					99,3 - 100,0 %				
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	005-16	L* interne	16,2 - 20,2 -									
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	005-17	a* interne	12,3 - 14,3 -									
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	005-18	b* interne	14,5 - 18,5 -									
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	005-20	a/b interne	0,84 - 0,88									
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	005-30	H*interne	46,0 - 53,0 -									
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	005-31	L* (Q)	18,5 - 22,5 -					17,5 - 23,5 -				
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	005-32	a* (Q)	13,0 - 14,9 -									
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	005-33	b* (Q)	15,6 - 19,3 -									
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	005-34	H* (Q)	48,8 - 53,8 -									
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	005-35	L* interne (calc)	16,2 - 20,2 -									
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	005-36	a* interne (calc)	12,3 - 14,3 -									
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	005-37	b* interne (calc)	14,5 - 18,5 -									
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	006-01	pH	6,6 - 7,0 -					6,5 - 7,1 -				
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	054-01	% Coques	<= 1,75 %									
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	060-01	% Cendres	< 14,00 %									
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	501-01	Germes totaux	<= 5.000 cfu/g									
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	503-01	COLIFORMES	<= 10 cfu/g									
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	505-01	Levures	<= 50 cfu/g									
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	506-01	Moisissures	<= 50 cfu/g									
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	507-01	Salmonelles	MICGEN NE13	negative #/750g								
	CPOWDER		BC D102C 25KG/SAC 30SAC/PAL	508-01	Enterobactériaceae	<= 10 cfu/g									

Pricing - limited to Pricing Officers - to be discussed

Pricing could be on a second wave of developing the tool.