



Products worthy of your confidence

Tomaž Pavlin

Kecskemét 2016

- **Introduction of EMO FRITE**
- **Our Products**
- **Challenges – Powder?**
- **Quality Assurance**
- **Our Advantages**

EMO FRITE

- a medium-sized private company whose main activities are:
- **producing and marketing** of frits and enamels for the enamel industry, frits and glazes for the ceramic industry and for grinding wheels, special frits and frits for glass
- **developing** new products and adapting existing products for our customers,
- **after-sales activities** (support at start-up, consulting, service...).



95%

**We export 95% of
our products and
knowledge**

20

**We are present in more
than 20 countries**

4

**We are on the European,
Asian, South American
and African market.**

HOW WE ACHIEVE THAT?



TRADITION

HUMAN RECOURCES

ENVIRONMENT

MANAGEMENT SYSTEM

HEALTH AND SAFETY

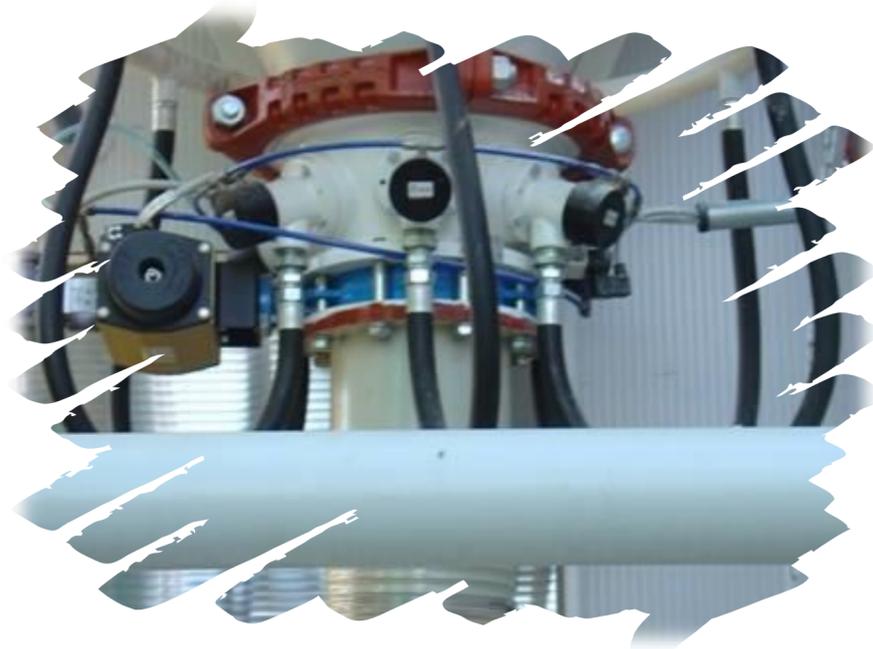
HISTORY – TRADITION



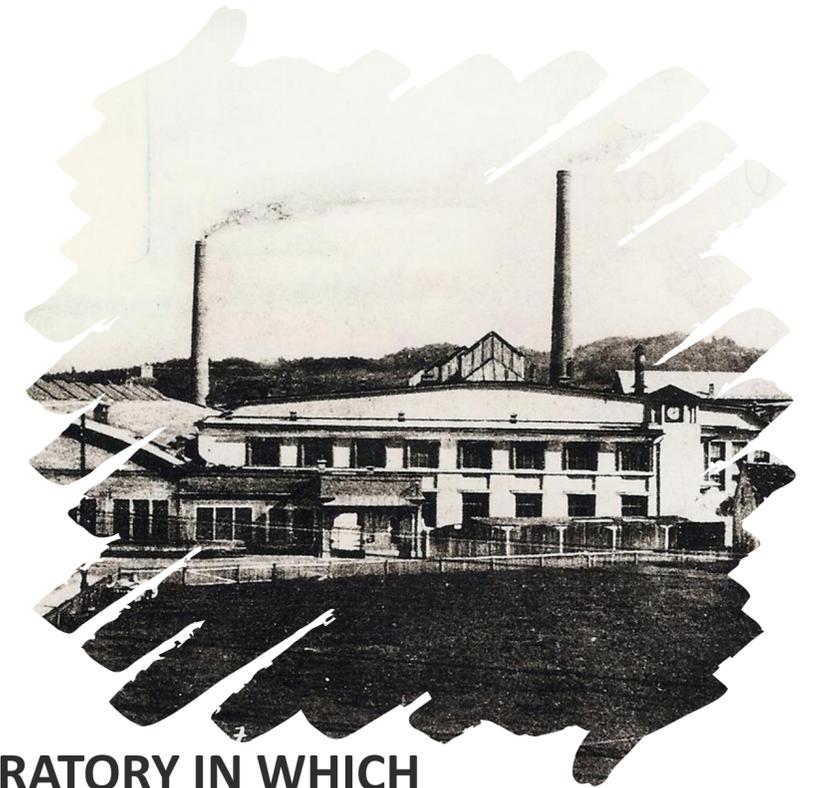
YEAR 1928
MELTING OF FRITS BY
GERMAN RECIPES

AFTER 1954
MELTING OF TITANIUM FRITS

YEAR 2000
PRODUCTION OF POWDER
ELECTROSTATIC ENAMELS



YEAR 1894
DISHWARE FACTORY –
Westen



YEAR 1947
BEGINNING OF R&D LABORATORY IN WHICH
GROUND AND ACID RESISTANT FRITS ARE
DEVELOPED

YEAR 1977
FRITS FOR CERAMIC

YEAR 2013
ECO INNOVATION
PROJECT



MANAGEMENT SYSTEM



ISO 9001 SINCE 1996



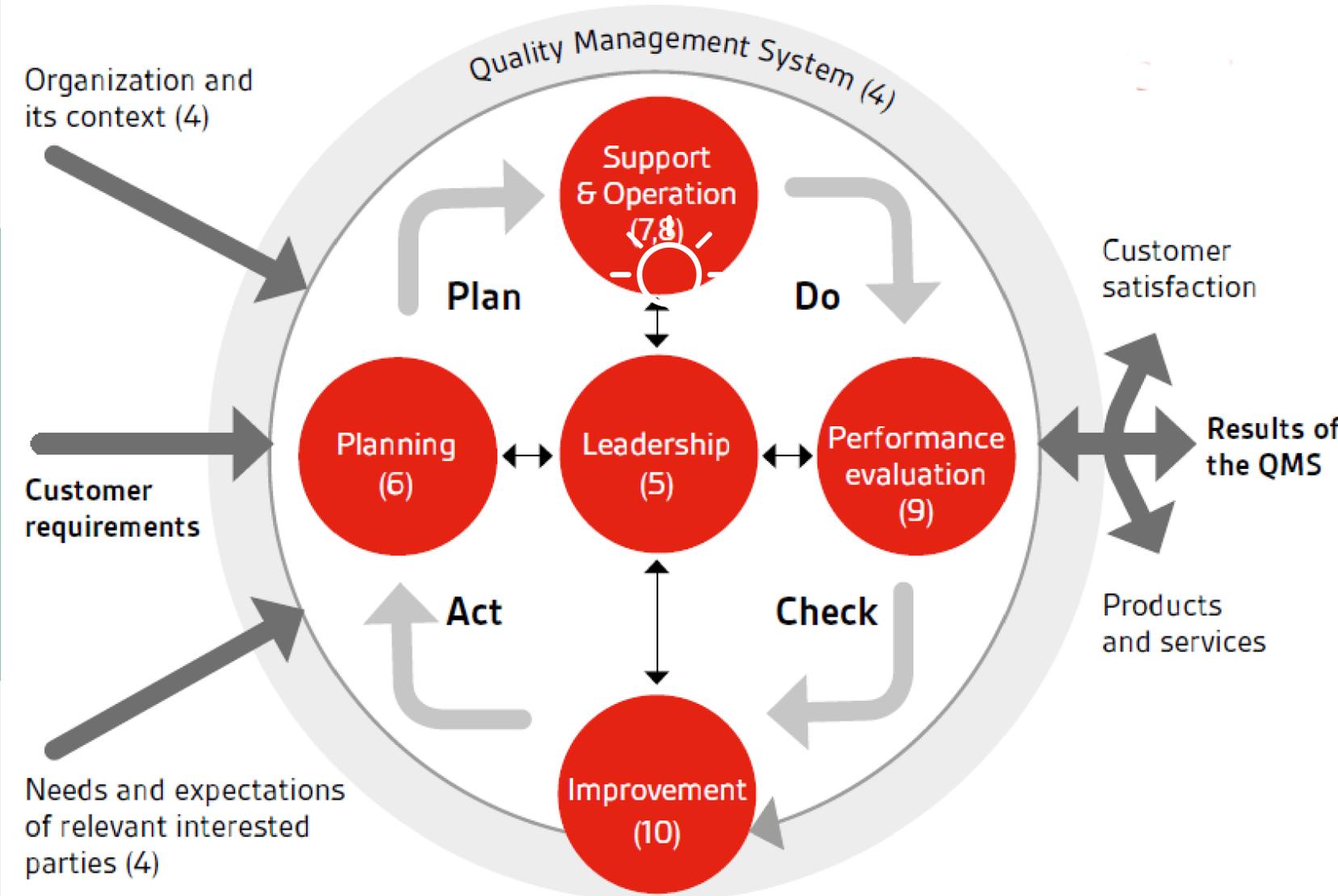
INCOPORATION OF ISO 14001 AND OHSAS REQUIREMENTS IN ISO 9001



NEW EDITION IN 2015, TRANSITION PERIOD TILL 2018



AUDITS FROM BUREAU VERITAS AND OUR CUSTOMERS



HUMAN RESOURCES



- EDUCATION AND TRAINING

- SOCIAL ACTIVITIES

- MOTIVATION AND REWARDING

- TEAM WORK

PRODUCTION PROGRAM

FRITS AND ENAMELS FOR STEEL SHEET

WET APPLICATION

Ground coat enamels for steel sheet

- steel sheet enamel grade
- thicker steel
- IF and problematic steel
- enameling steel without acid pretreatment

Cover coat enamels for steel sheet

- titanium white enamels
- titanium enamels for pastel colours
- coloured enamels (transparent frits for bright and dark colours)
- self-coloured enamels (used with or without adding pigment)
- beading enamel





PRODUCTION PROGRAM

FRITS AND ENAMELS FOR STEEL SHEET

Direct enamels for steel sheet:

- direct black, acid-resistant enamels
- easy-to-clean enamels
- direct brown enamels
- alkali-resistant enamels
- enamels for water heaters

- **Frit**
- **RTU (ready to use)**
- **RTM (ready to mill)**

PRODUCTION PROGRAM

FRITS AND ENAMELS FOR STEEL SHEET

ELECTROSTATIC POWDER ENAMELS

- ground coat powder enamels
 - 1c/1f (one coat, one firing)
 - 2c/1f (two coats, one firing)
- cover coat powder enamels
 - 2c/2f (two coats, two firing)
 - 2c/1f (two coats, one firing)
- powder enamels for water heaters
- direct enamels
- easy-to-clean enamels (ETC)
- pyrolitic



PRODUCTION PROGRAM

OTHER FRITS AND PRODUCTS

FRITS AND GLAZES FOR CERAMIC

FRITS AND BONDS FOR CERAMIC BONDS IN
GRINDING WHEELS

FRITS FOR ENAMELING GLASS

SPECIAL FRITS AND GLASSES



PRODUCTION PROGRAM

AFTER-SALES ACTIVITIES

- SERVICE
- CONSULTING
- SUPPORT AT START-UP

CHALLENGES IN THE ENAMELING INDUSTRY

ENERGY

Price of Energy

RAW MATERIALS

Narrowing of the raw materials market
Restriction on use of certain components

DEVELOPMENT

Resource – energy saving technology

REDUCING THE FIRING TEMPERATURE

COMBINATION OF COMPONENT

$\text{Li}_2\text{O}_3\text{-TiO}_2$
 ZrO_2

CONSTANCY OF PROPERTIES

HIGH QUALITY

CHALLENGES



FAST RESPONSE

- OBJECTIVE FACTORS
- SUBJECTIVE REQUIREMENTS

COOPERATION

- TECHNOLOGISTS
- EXPERTS
- UNIVERSITIES

DEVELOPMENT

- NEW TYPES OF ENAMELS
- NEW COMPOSITIONS AND PROPERTIES

CHALLENGES

PRODUCTION PRINCIPLES

- Technological characteristics of production



SCIENTIFIC PRINCIPLES

- Developing of enamel properties (physico-chemical and structure laws)



METHODOLOGY AND PRINCIPLES OF DEVELOPMENT

TRENDS AND DIRECTIONS

- Economic factors
- New guidelines



CHALLENGES

THE STARTING POINTS OF DEVELOPMENT

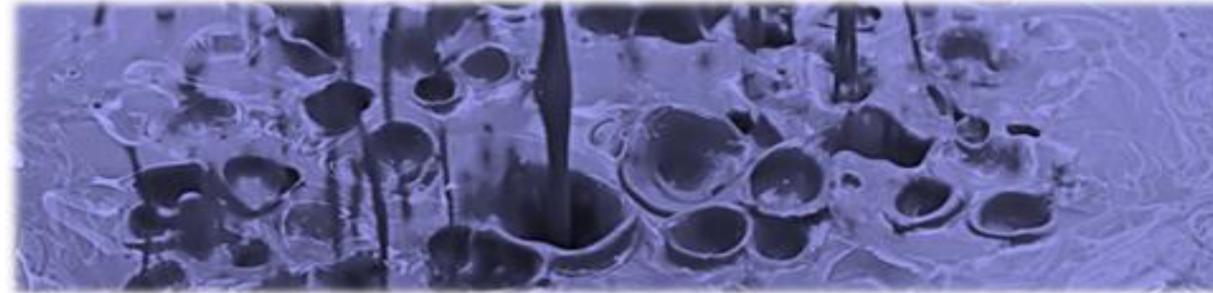
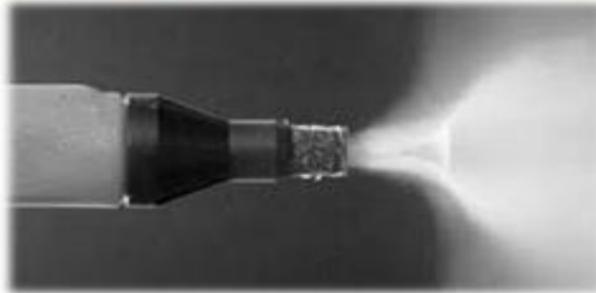


Type
Purpose

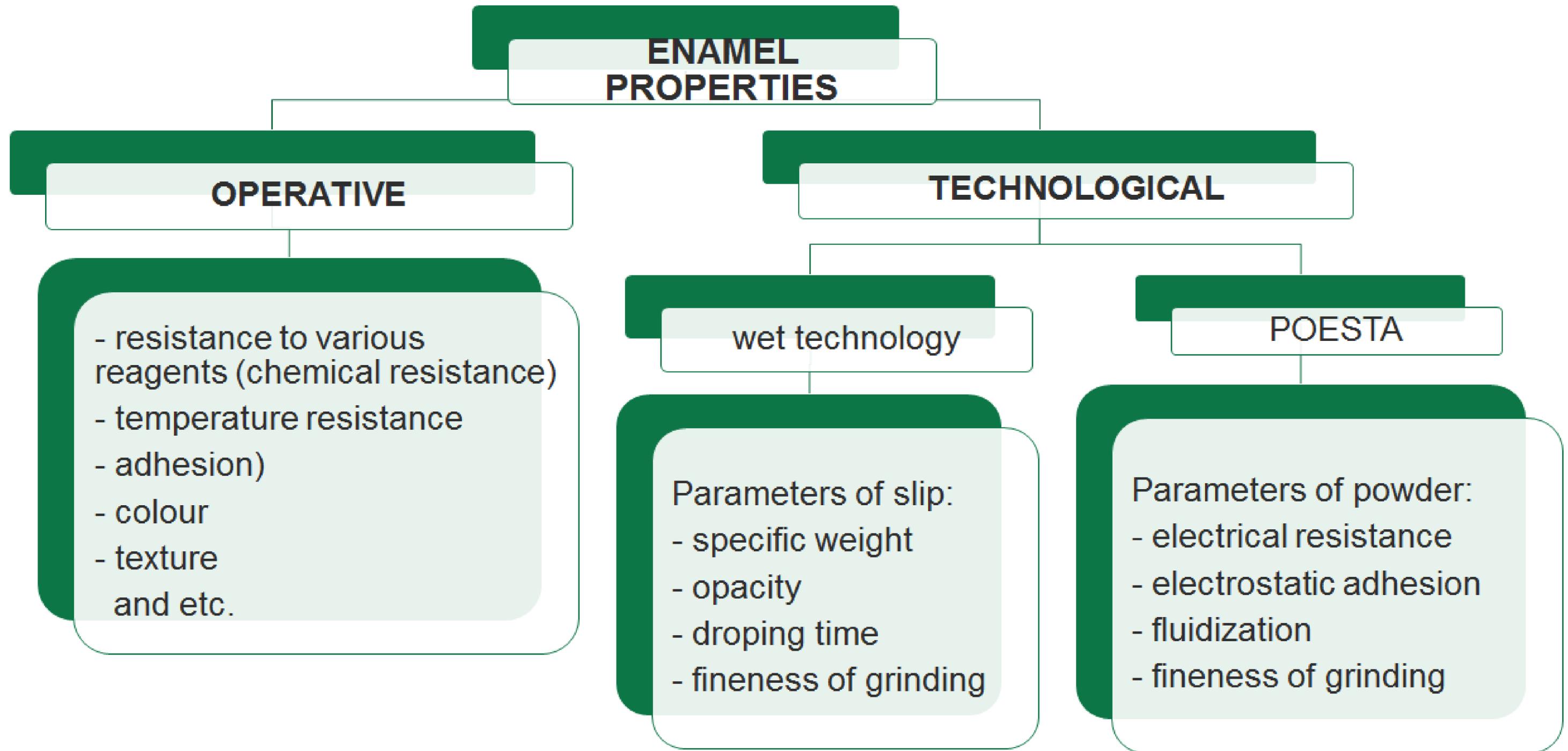
Properties:
• technological
• operative

Enamel
coating
technology

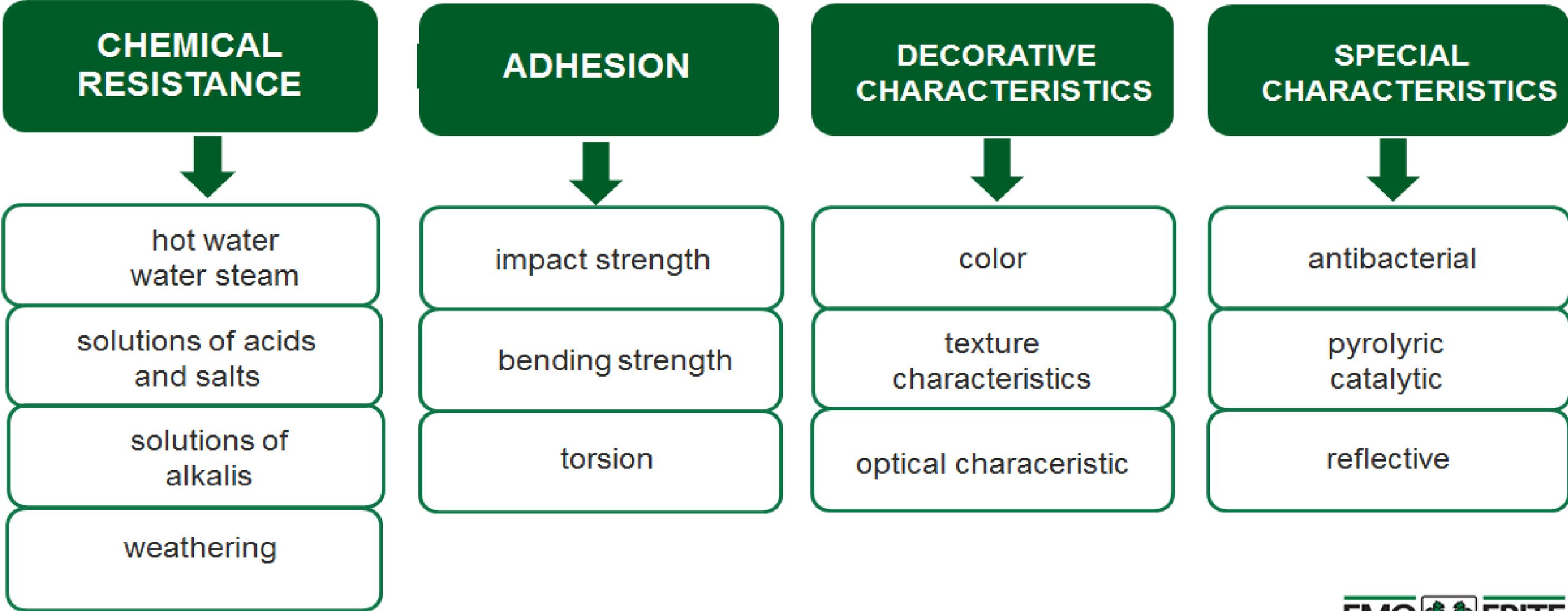
Sheet
Regimes
Color



CHALLENGES



OPERATIVE PROPERTIES OF ENAMELS



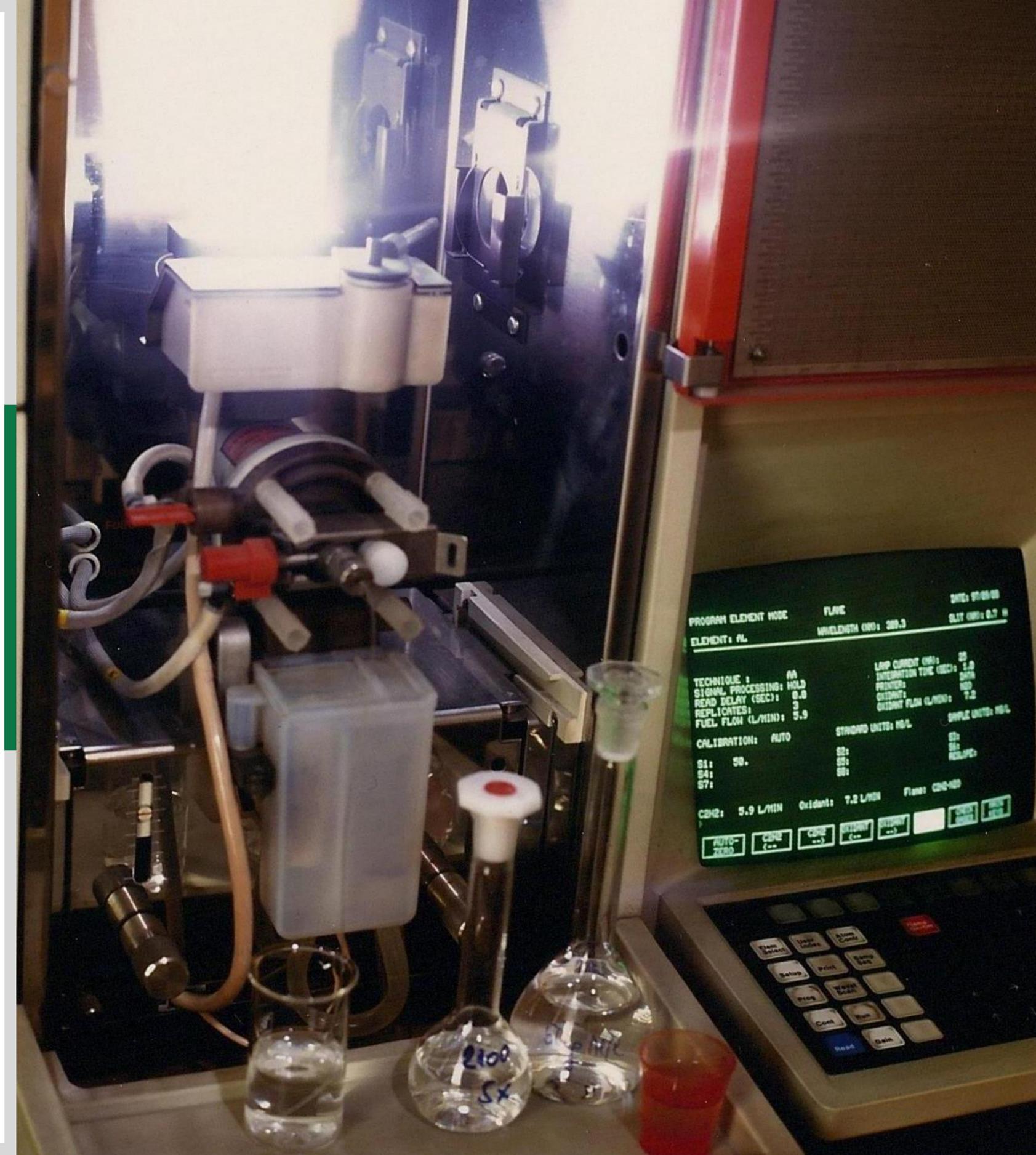
QUALITY ASSURANCE

INPUT CONTROL OF RAW MATERIALS

- selection of raw material
- control plan
- system of archiving samples
- unverified materials do not enter the production

COMPOSITIONS FOR MELTING AND MILLING

- approved and launched to production by computer program
- automated guided weighing
- automated guided dosage system from silos



QUALITY ASSURANCE



SMELTING OF FRITS

Rotary kilns enable us to flexibly adapt the production to the needs of our customers.

- automatic rotation of kilns,
- controlled burners ,
- measuring of temperature, control over the melt,
- smooth floss, granulation ...



QUALITY ASSURANCE



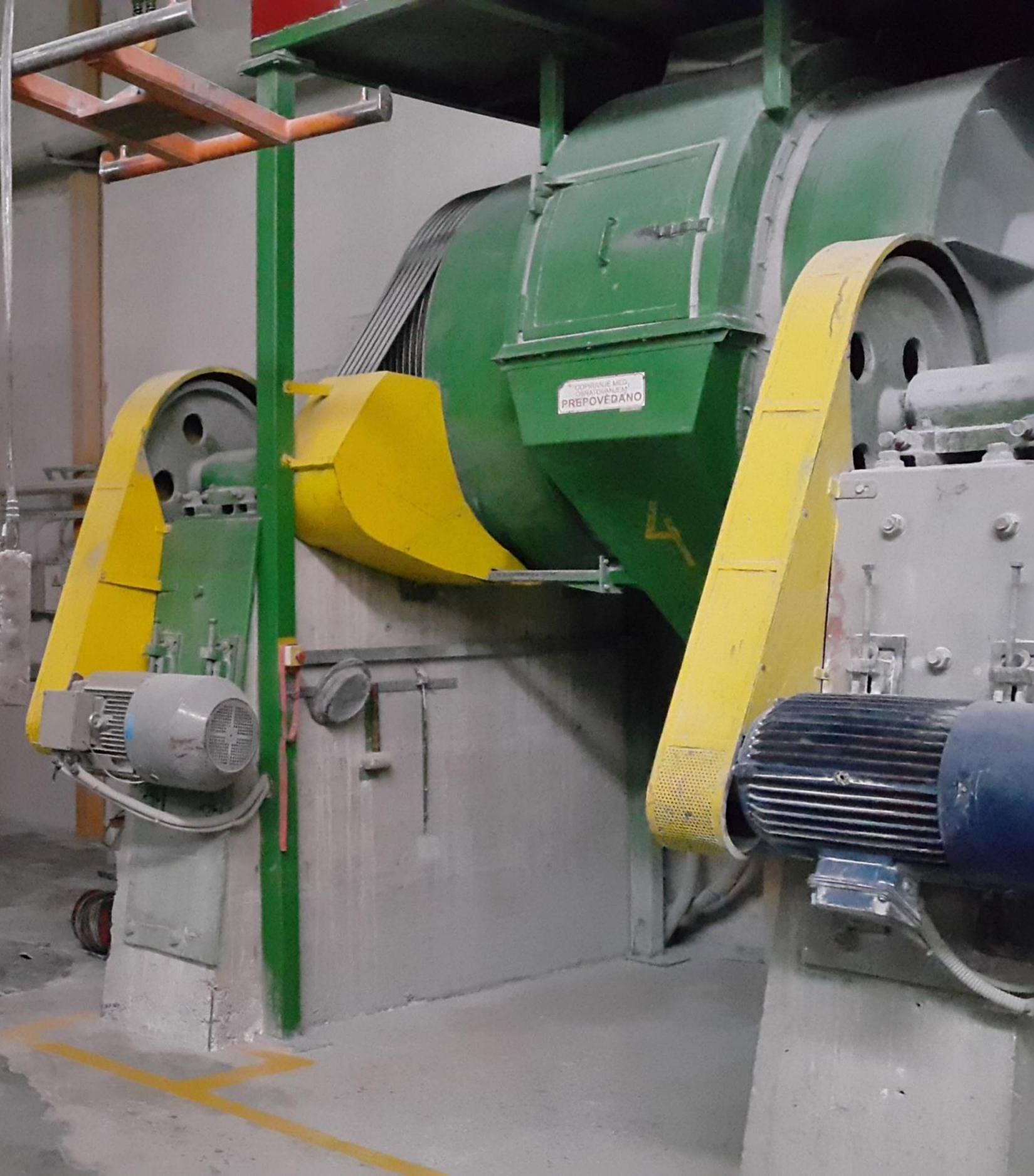
DRYING AND SIEVING

- measuring of humidity
- sieving for removing the impurities



PACKING AND FINAL CONTROL

- weight of every bag is recorded in computer
- labeling



QUALITY ASSURANCE

MILLING IN BALL MILLS

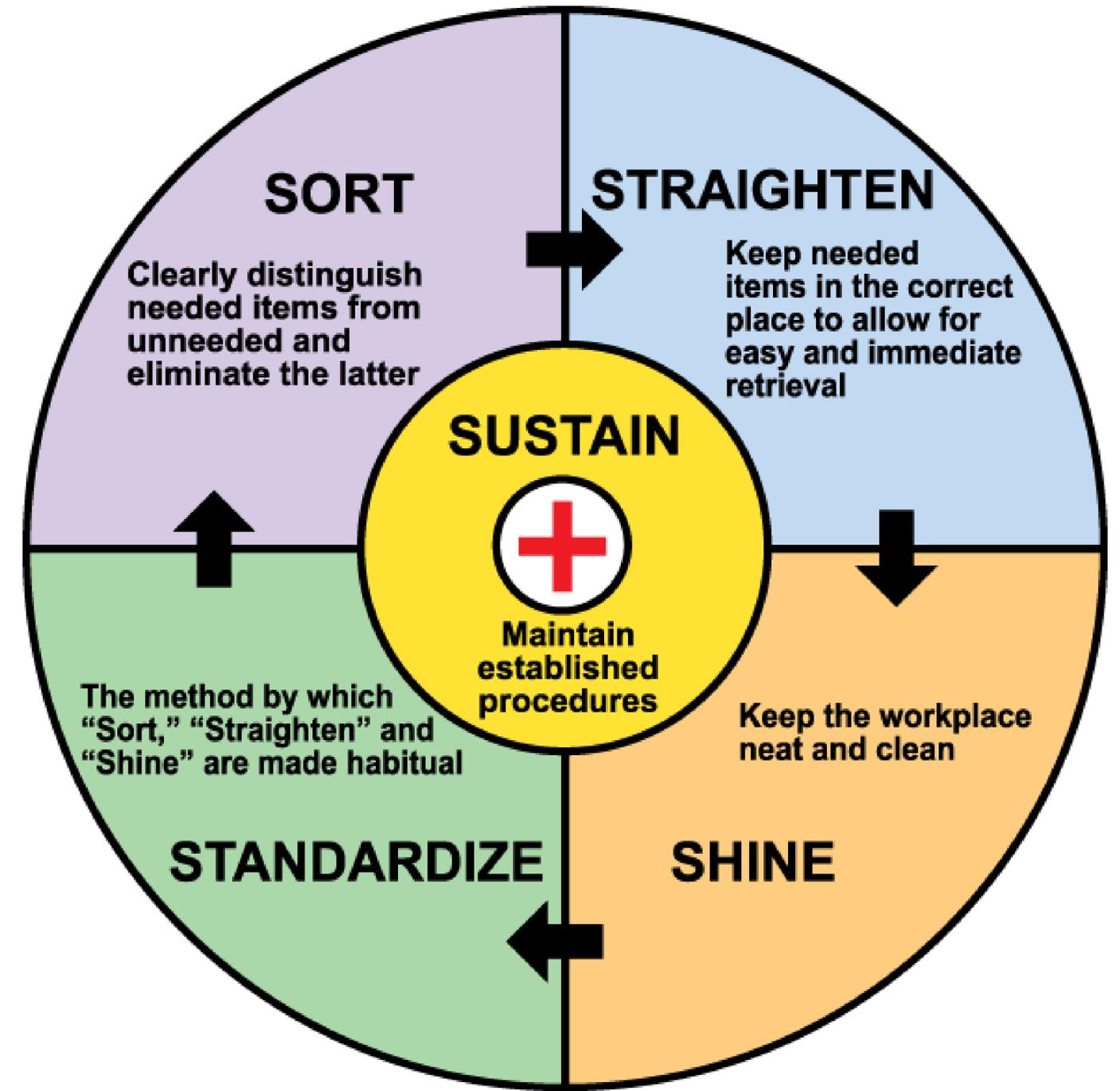
- accurate weighing of components
- regulation of mill rotation and electronic recording of data
- control of fineness
- sieving

MILLING OF ELECTROSTATIC POWDER

- accurate dosing of silicon additions
- sieving

QUALITY ASSURANCE

5S



QUALITY ASSURANCE

CONTROL PLAN FOR EVERY PRODUCT

- sampling
- humidity
- fineness
- enameled plate/glazed tile
- adherence
- colour difference
- uniform surface
- button test

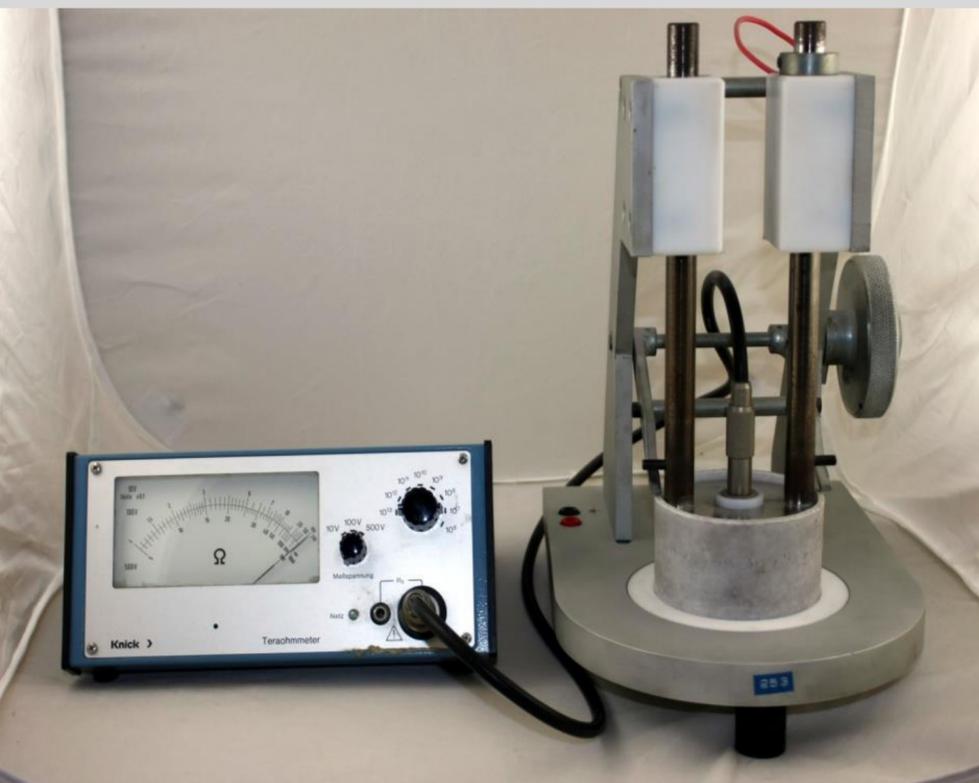


QUALITY ASSURANCE



CONTROL METHODS-POWDER ENAMEL

- fineness
- adherence of powder to steel plate
- electrical resistivity
- fluidity
- enameled plate





QUALITY ASSURANCE

FINAL CONTROL OF PRODUCTS

- standard samples for every product
- control plan for every product
- records of the final control for every batch
- 24/7
- control plates for every batch - kept for 6 months
- samples of production series

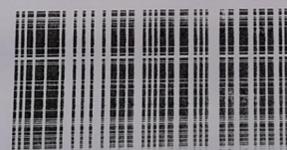
QUALITY ASSURANCE

TRACEABILITY - batch number and date

- which material was used
- on which equipment was produced
- who were the workers in each phase of process
- control data
- sample 6 months from production date
- plate 6 months from production date

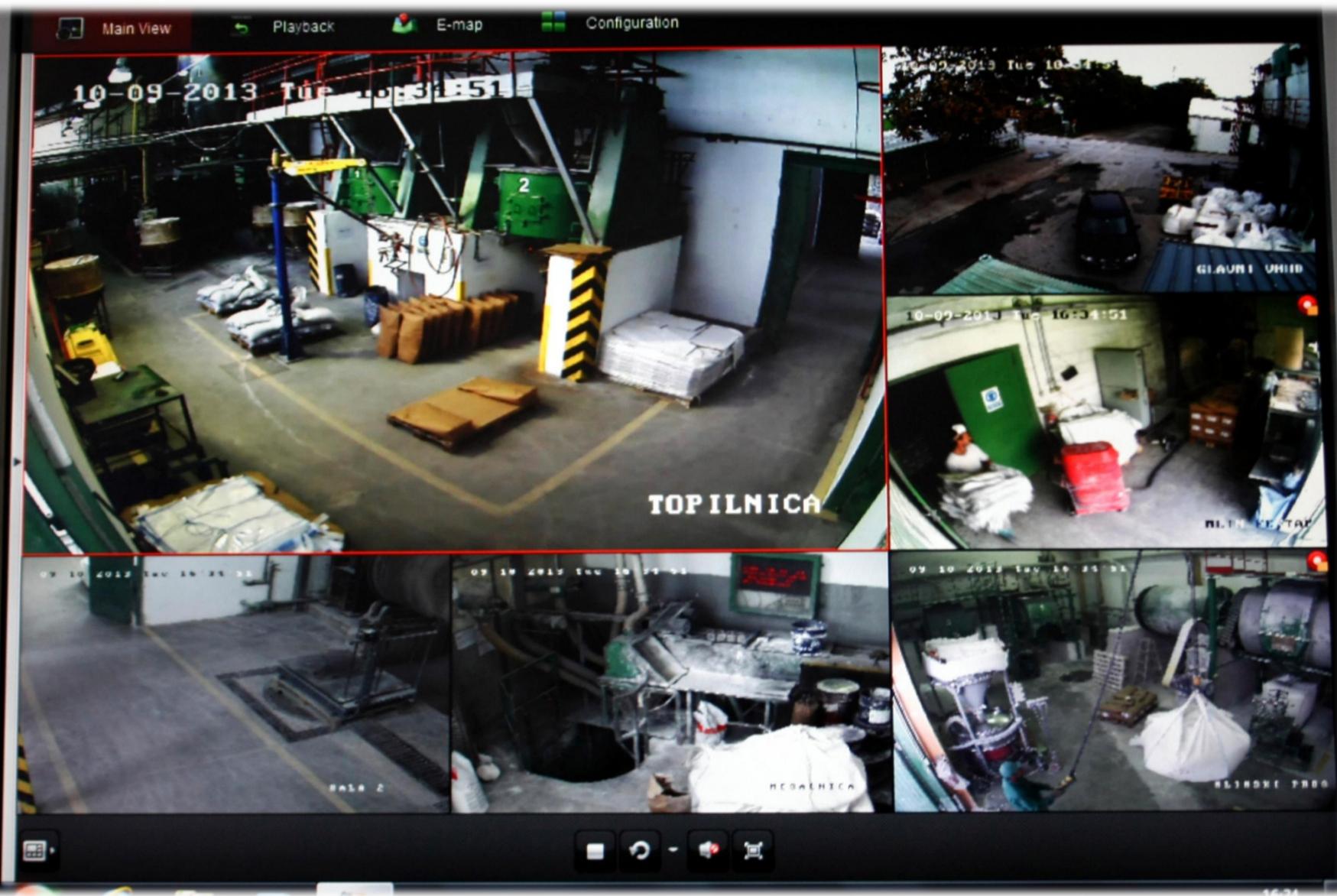
EMO  **FRITE**
EMO FRITE d.o.o., Bežigrajska cesta 2 b, 3000 Celje, Slovenia
www.emo-frite.si info@emo-frite.si

E-1175



3 838725 206202

Batch: **1379**
Neto: 25 kg
Date: 9.05.2016
Customer:



QUALITY ASSURANCE

VIDEO SUPERVISION OF PRODUCTION

RECORDS OF EVERY BATCH WE PRODUCE

Pregled proizvedenih šarž

Po šifri | Po receptu | Po času | Po del. šifri | Datum: [] | JAN 1990 | JUN 2003

šifra	recept	šifra rec.	datum	čas	del.š.	P	kval.	dob.RCP	dob.SAR	opombe
285090	R-1181	20075/01	25.05.2003	0:10	5952	5	1S	365.000	382.300	
284939	R-1521	20100/00	25.05.2003	0:45	3216	3	1S	372.000	367.710	
285091	R-1181	20075/01	25.05.2003	2:20	5953	5	1S	365.000	385.950	
284940	R-1521	20100/00	25.05.2003	2:55	3217	3	1S	372.000	381.060	
285092	R-1181	20075/01	25.05.2003	4:30	5954	5	1S	365.000	383.100	
284941	R-1521	20100/00	25.05.2003	5:05	3218	3	1S	372.000	376.140	
285093	R-1181	20075/01	25.05.2003	6:40	5955	5	1S	365.000	373.300	
284942	R-1521	20100/00	25.05.2003	7:15	3219	3	1S	372.000	412.170	
285094	R-1182	20076/01	25.05.2003	8:55	5956	5	1S	355.000	372.580	
285010	R-1520	20050/00	25.05.2003	9:30	3220	3	1S	372.100	351.000	
285095	R-1182	20076/01	25.05.2003	11:05	5957	5	1S	355.000	376.410	
285011	R-1520	20050/00	25.05.2003	11:40	3221	3	1S	372.100	373.600	
285096	R-1182	20076/01	25.05.2003	13:15	5958	5	1Č	355.000	395.430	
285012	R-1520	20050/00	25.05.2003	13:50	3222	3	1Č	372.100	372.980	

QUALITY ASSURANCE

PERIODIC CONTROL PROCEDURES

- determination of characteristic points on heating microscope
- measuring of dilatation
- chemical composition
- different flow tests
- chemical resistivity



QUALITY ASSURANCE

Testing resistance to hot water is in accordance to standard **DIN 4753-3:2011** and migration test for 15 elements for our boiler enamel.



Appendix to test report No. 20130846

Type of enamel: Emo Frite E-4414

date: 07.06.2013

element	test value (=PW) ¹⁾ [mg/L]	C _{Tap} [mg/L]										average level 7	C _{Tap,level 7} ≤ PW
		level 1.A	level 1.B	level 2.A	level 2.B	level 3.A	level 3.B	level 6.A	level 6.B	level 7.A	level 7.B		
Al	0,100	0,0174	0,0166	0,0085	0,0064	0,0055	0,0091	0,0041	0,0046	0,0022	0,0025	0,0024	yes
Ba	0,070	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	0,0002	0,0002	0,0002	0,0004	0,0004	0,0004	yes
Pb	0,0005	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	yes
B	0,100	0,0330	0,0273	0,0179	0,0152	0,0156	0,0142	0,0126	0,0115	0,0116	0,0110	0,0113	yes
Cd	0,00015	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	yes
Ce	0,020	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	yes
Cr	0,005	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	yes
Co	0,005	0,0046	0,0052	0,0026	0,0025	0,0020	0,0021	0,0015	0,0014	0,0012	0,0013	0,0012	yes
Cu	0,200	0,0037	0,0023	0,0015	0,0013	0,0029	0,0039	0,0048	0,0056	0,0089	0,0091	0,0090	yes
Mn	0,005	0,0011	0,0014	0,0007	0,0008	0,0006	0,0007	0,0006	0,0006	0,0005	0,0005	0,0005	yes
Ni	0,002	0,0003	<0,0001	<0,0001	<0,0001	0,0001	0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	yes
Mo	0,007	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	yes
Sr	0,210	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	yes
Ti	0,070	<0,0001	0,0002	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	yes
Zr	0,005	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	yes

¹⁾ test value according to the guideline for hygienic evaluation of enamel and ceramic materials in contact with drinking water (German Federal Environment Office (UBA), draft of 27. August 2012).



Products worthy of your confidence



OUR ADVANTAGES



Our own development



High control of the production process



Individual treatment for each customer

OUR ADVANTAGES



Flexible production



Short response time

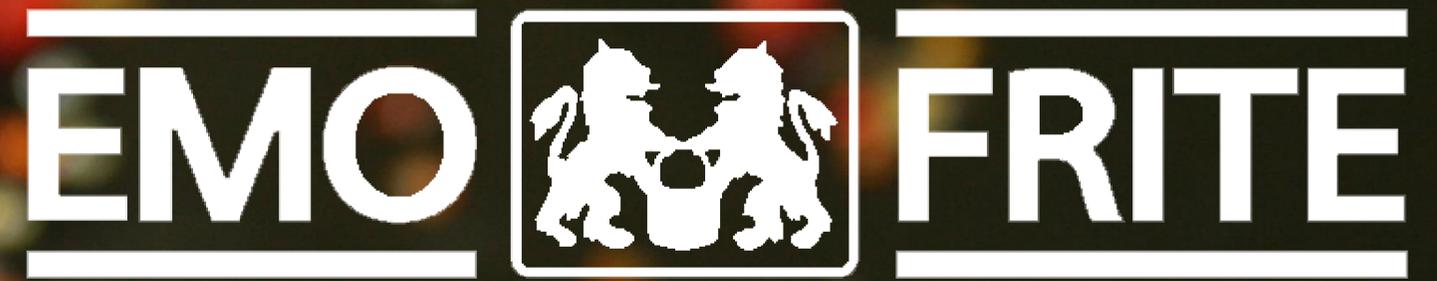


Quality of products



OUR ADVANTAGE

**WE ARE SUPPLIERS OF MANY SUCCESSFUL
COMPANIES
WE HAVE A DEEP COOPERATION AND PARTNERSHIP
WITH TOBIZO**



Products worthy of your confidence

