EMO FRITE

Products worthy of your confidence

ENAMELLERS MEETING AND CONSULTATION 2016 - 18.09. 2016 - 21.09.2016

ALL LECTURES COMBINED

EMO FRITE

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Nada Božiček

Portorož 2016

- Introduction of EMO FRITE
- Our Products
- Quality Assurance
- Our Advantages

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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...).

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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

MANAGMENT SYSTEM

HEALTH AND SAFETY

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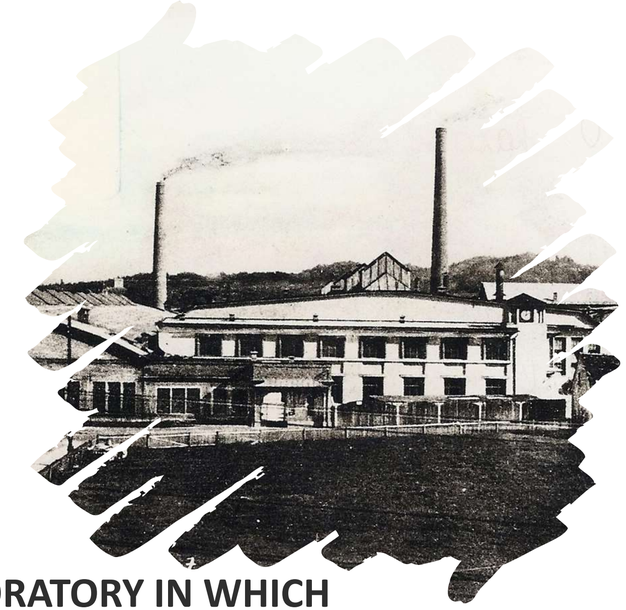
HISTORY – TRADITION

YEAR 1894

DISHWARE FACTORY – Westen



YEAR 1928

MELTING OF FRITS BY GERMAN RECIPES

YEAR 1947

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

AFTER 1954

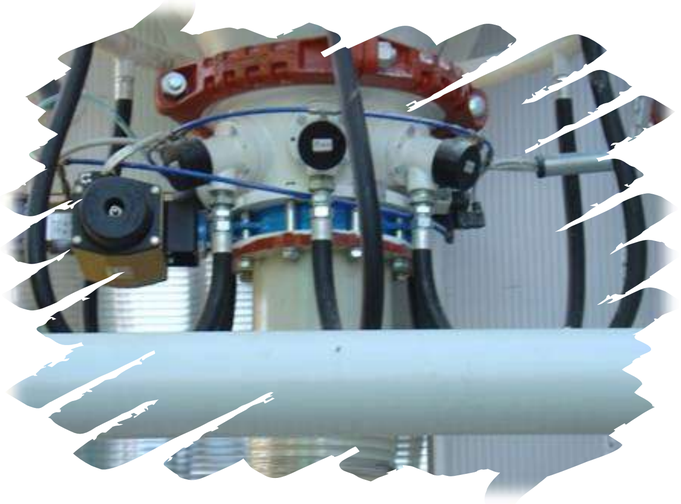
MELTING OF TITANIUM FRITS

YEAR 1977

FRITS FOR CERAMIC

YEAR 2000

PRODUCTION OF POWDER ELECTROSTATIC ENAMELS



YEAR 2013

ECO INNOVATION PROJECT

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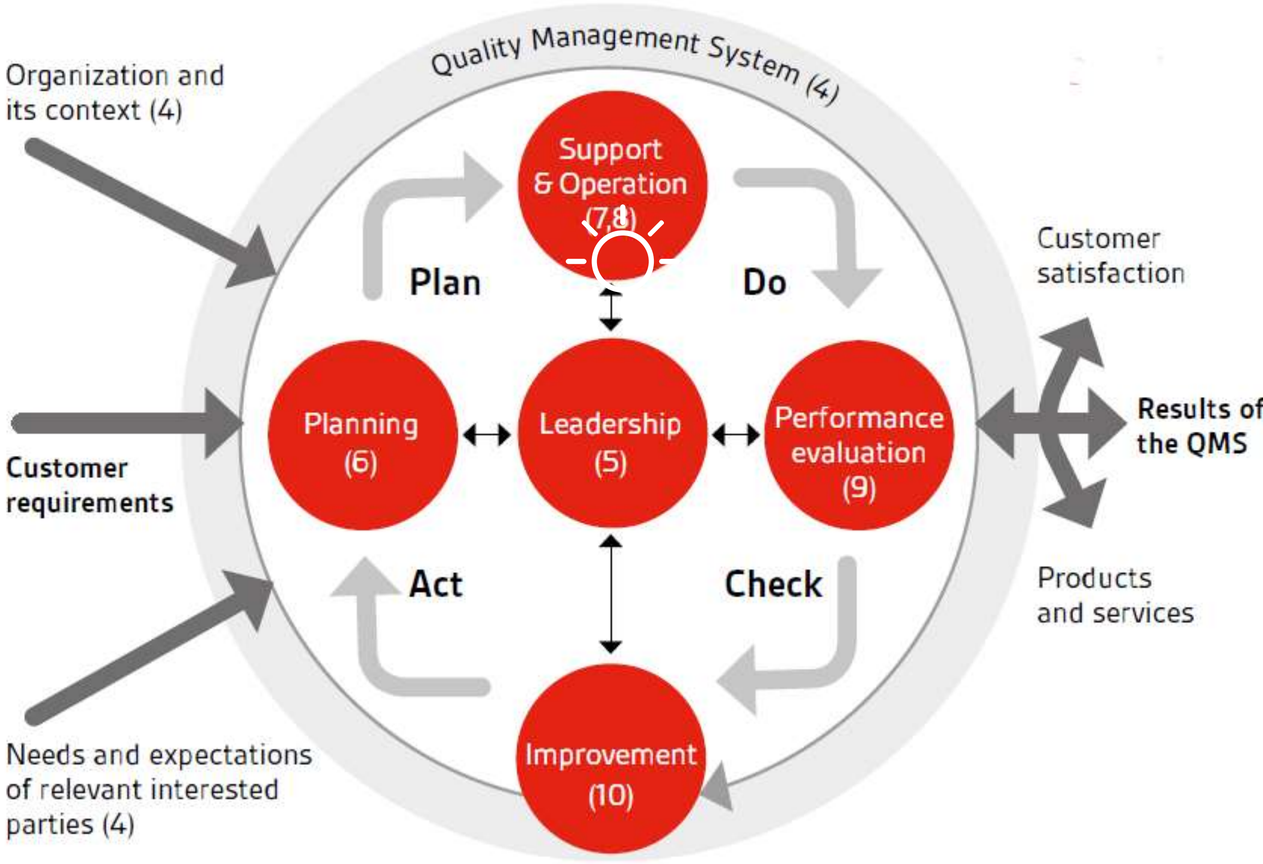
MANAGEMENT SYSTEM

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

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ENVIRONMET, HEALTH AND SAFETY

- SAFETY IN WORK ENVIRONMENT
- PROTECTION OF HEALTH
- PREVENTION
- HEALTH PROMOTION AND EDUCATION

- FULLFILING THE LEGISLATION REQUIREMENTS
- REDUCING EMISSIONS TO AIR
- RECYCLING THE WATER
- SAFE USE OF CHEMICALS
- WASTE DISPOSAL
- ENERGY SAVING
- COMPLIANCE WITH REACH, RoHS, SVHC

PRODUCTION PROGRAM

FRITS AND ENAMELS FOR STEEL SHEET

Ground coat enamels for steel sheet

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

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

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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 – process
    - 1c/1f (one coat, one firing)
    - 2c/1f (two coats, one firing)
- cover coat powder enamels – process
    - 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 ENAMELIG GLASS

SPECIAL FRITS AND GLASSES

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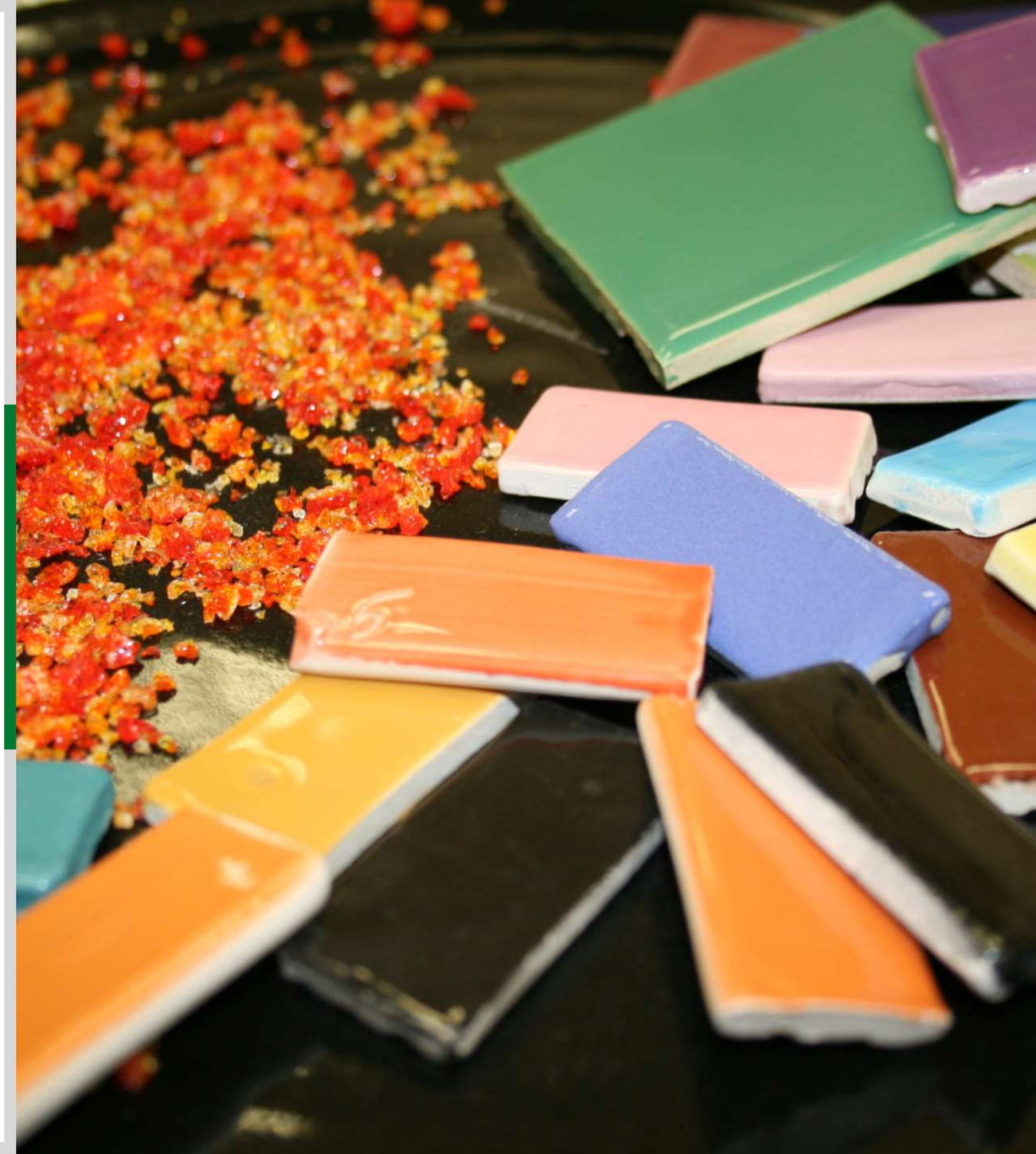

PRODUCTION PROGRAM

AFTER-SALES ACTIVITIES

- SERVICE
- CONSULTING
- SUPPORT AT START-UP

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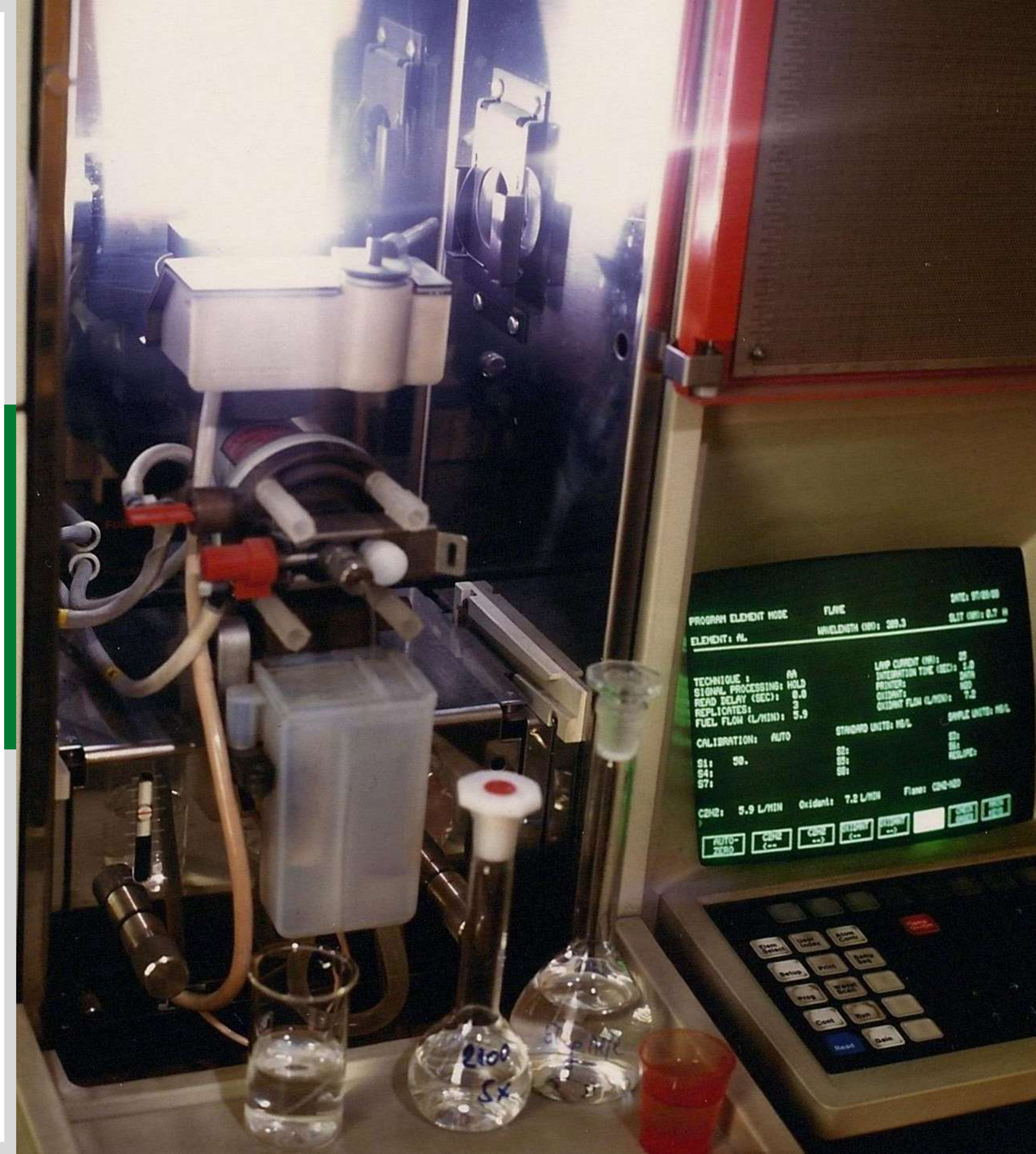
QUALITY ASSURANCE

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



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QUALITY ASSURANCE

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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

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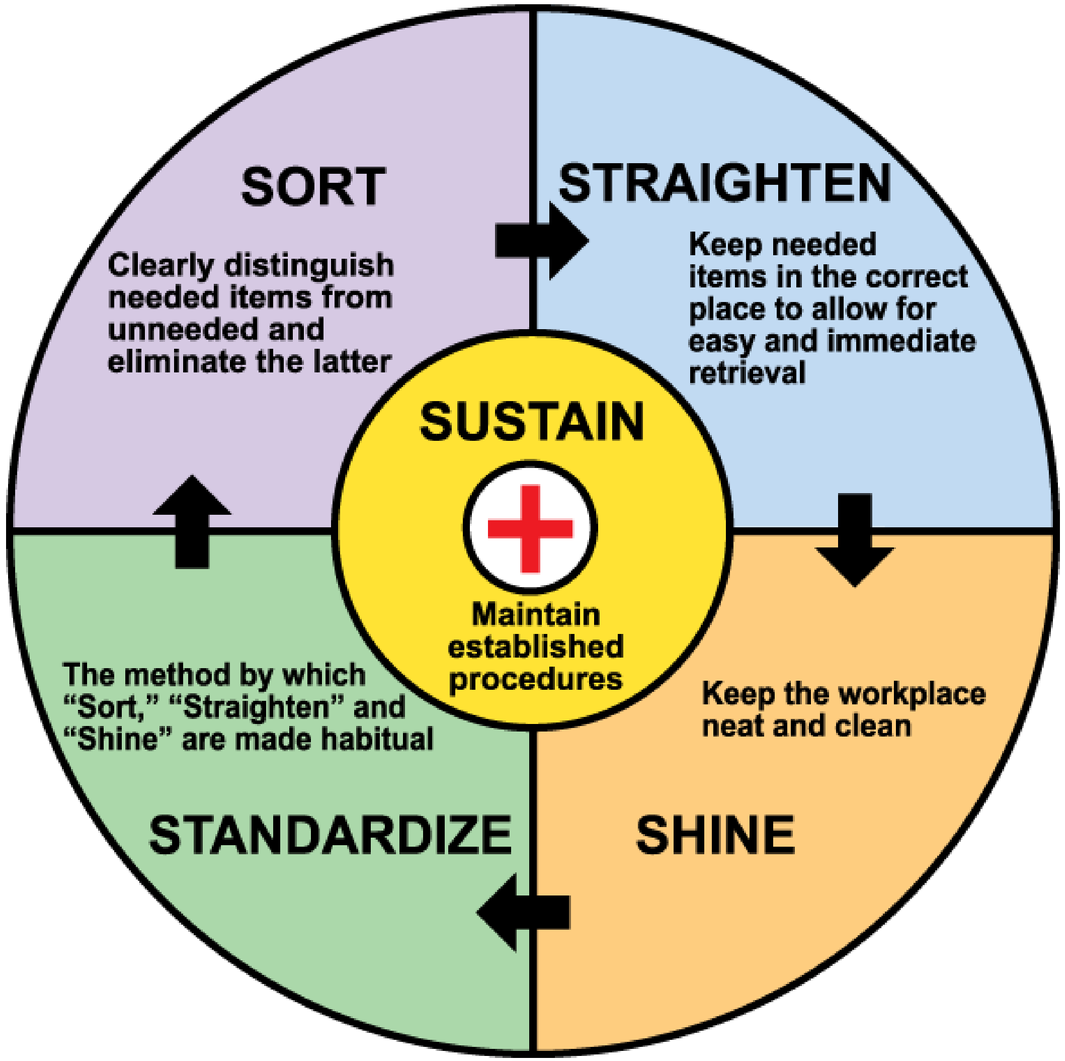
QUALITY ASSURANCE

5S



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QUALITY ASSURANCE

CONTROL PLAN FOR EVERY PRODUCT

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

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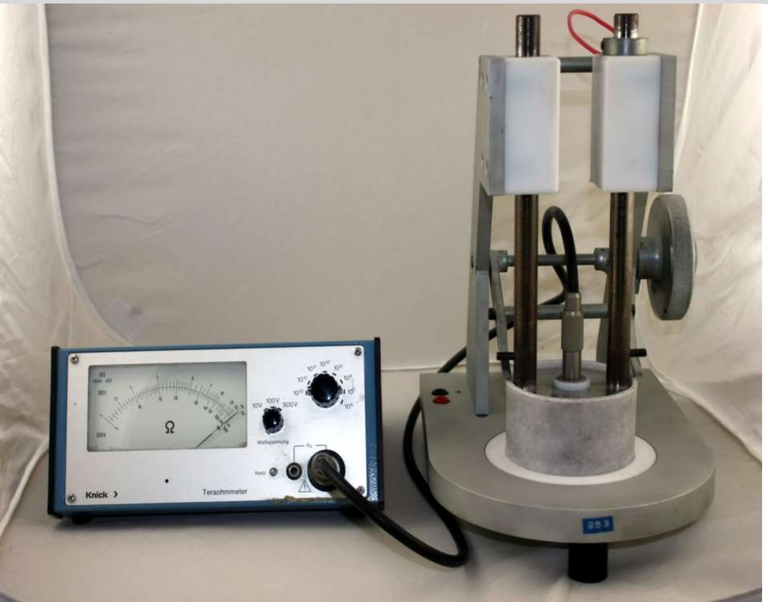
QUALITY ASSURANCE



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

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QUALITY ASSURANCE

TRACEABILITY - batch number and date

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

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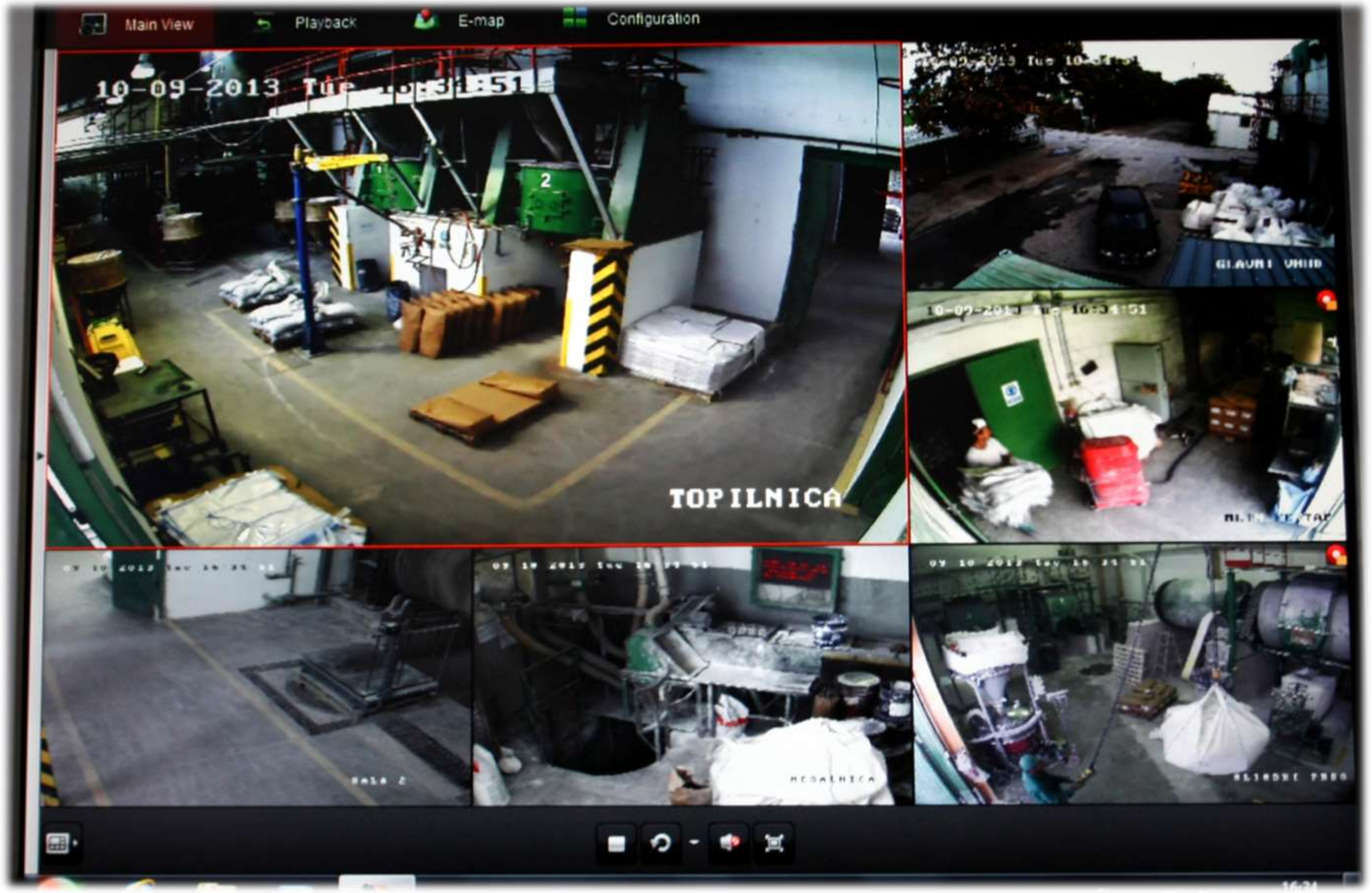
QUALITY ASSURANCE



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	

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QUALITY ASSURANCE

PERIODIC CONTROL PROCEDURES

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

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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]											
		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	average level 7	$c_{Tap,level\ 7} \leq PW$
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).

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OUR ADVANTAGES

Our own development

High control of the production process

Individual treatment for each customer

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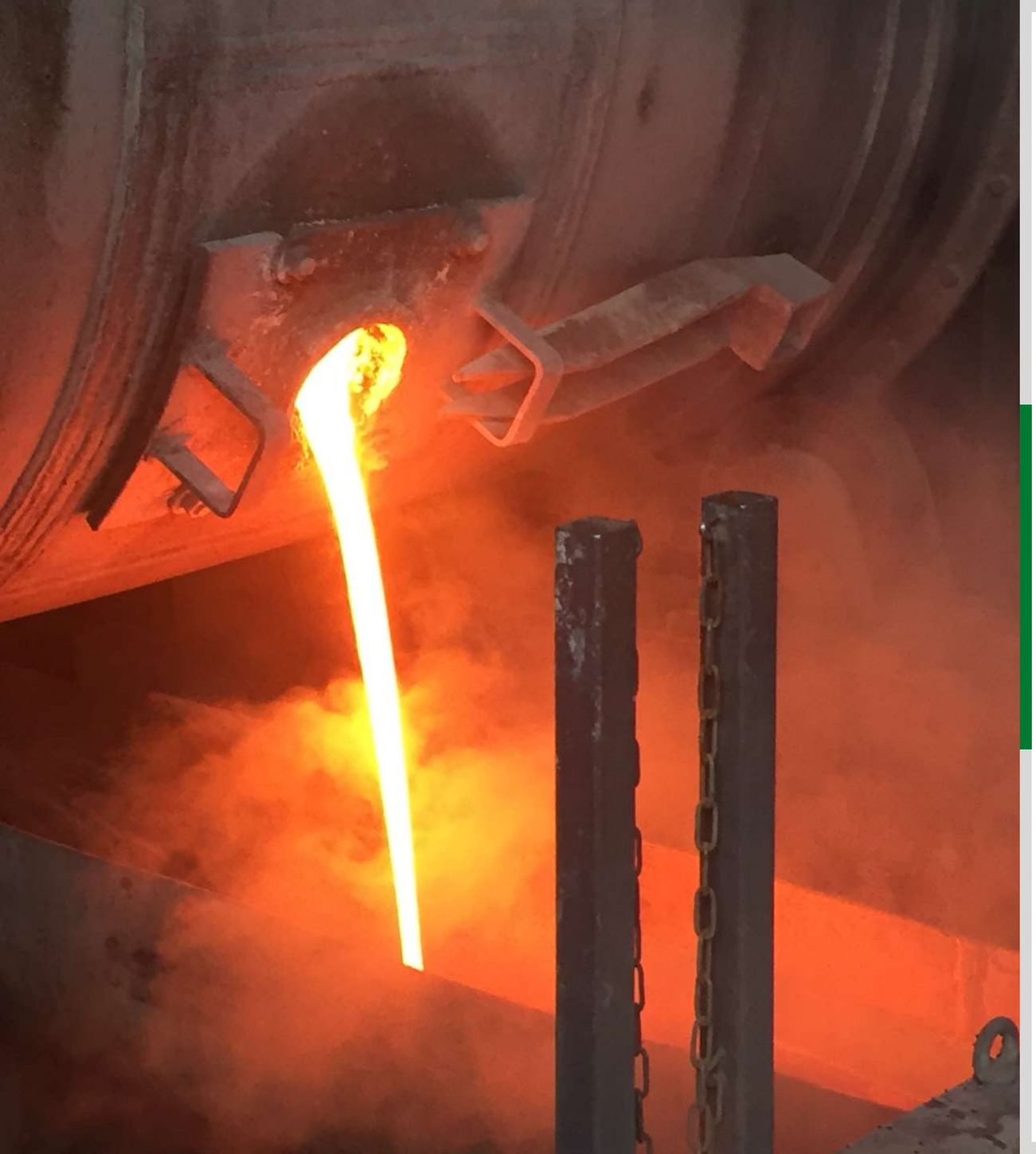
OUR ADVANTAGES

Flexible production

Short response time

Quality of products



OUR ADVANTAGE

WE ARE SUPPLIERS OF MANY SUCCESSFUL WELL KNOWN INTERNATIONAL COMPANIES

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METALLCHEMIE

Presentation of the company Metalchemie

Group of companies

METALLCHEMIE Österreich

METALLCHEMIE Polen

METALLCHEMIE Ungarn

METALLCHEMIE Ukraine

KIESOW Spanien

KIESOW DR. BRINKMANN Deutschland

prolectro Frankreich

prolectro 宝莱多贸易有限公司 China

METALLCHEMIE
KIESOW GRUPPE

KIESOW Dr. Brinkmann is one of the leading companies in electro-plating with a wide range of services.

METALLCHEMIE
KIESOW GRUPPE

METALLCHEMIE Ges.m.b.H. was founded 1968 in Aurolzmünster near Ried/Innkreis and is a subsidiary of the KIESOW Company-group with headquarter in Detmold/Westfalen. we also manufacture our products for pre- and post-treatment and finishing of metal surfaces according to their proven formulas.

We supply the markets in central and eastern Europe and are characterized by a powerful network of logistics and technical service - able to optimally serve these markets.

Enamel pre-treatment

The pre-treatment of steel before enamelling has to fulfill specific requirements, to achive a pore-free and void-free mounting of the enamel.

- EKASIT and SURFACLEAN - Degreasers
- SURFASEAL - Passivations

Enamel pre-treatment

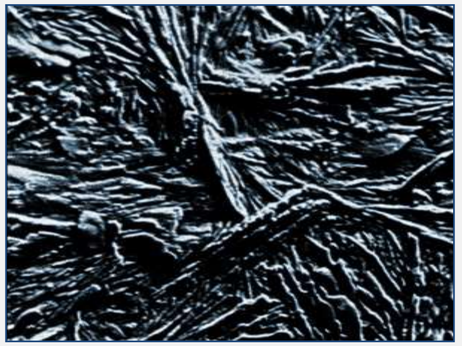
- EKASIT Spray 1420/F : spray degreaser, liquid
- EKASIT Spray 1780 : spray degreaser, solid
- SURFACLEAN 900 : dip cleaner, solid
- SURFACLEAN V 149 : universal cleaner, liquid

- SURFACLEAN Additives : wetting agents for various applications

Enamel pre-treatment

- ALPHA, OMEGA, BETA, 764 : pickling additives
- SURFASEAL 16 : universal passivation, solid
- SURFASEAL 20 : universal passivation, liquid
- Corrosion inhibitor ROSTSCHUTZMITTEL RM 551
- SEDAC 705 : Flocculant for waste water treatment
- Antifoam agents

Phosphating agents



Lacquered or powder coated surfaces need efficient iron or zinc phosphate process, whose functions are:

- Cleaning the metal surface.
- Building an adherent phosphate layer.

- SURFASIT – iron phosphate processes
- SURFACOTE – zinc phosphate processes
- SURFACOTE – manganese phosphate processes

Electroplating pre-treatment

Electroplated deposits need a clean base material.

Cleaners of our EKASIT and SURFACLEAN range fully meet these demands.
All emulsifiers and wetting agents are biodegradable.

Liquid and powder cleaners for:

- Soak
- Spray
- Electrolytic
- Ultrasonic

Decorative electroplating

Our electrolytic plating processes (for rack and barrel application) are suitable for metal and plastic surfaces.

- CHELUX – cyanide copper system
- RUBIN – acidic copper system
- ORION and SIRIUS – bright nickel electrolytes
- MERKUR – electrolyte for pearl bright and aluminium effect
- SAPHIR – trivalent and hexavalent chromium electrolytes

Functional electroplating

Our functional electrolytic systems are used in many sectors of the industry.

Main focus is corrosion protection in the automotive and metal fitting sector.

- TOPAS – alkaline / cyanide-free zinc process
- TOPAS / OPAL – zinc alloy baths
- AZUR – bright acid zinc bath
- SAPHIR – hard chromium process
- Further special processes available

Passivations

For optimum corrosion protection it is necessary to passivate zinc, zinc alloy and aluminium layers.

The surface can be sealed additionally by using our top-coats.

- **PROSEAL** passivations
- Chromate-free
- High corrosion protection
- Multi-functional

- **SURFASEAL** Top-coats based on:
- wax
- all kinds of polymers
- Inorganic and organic components

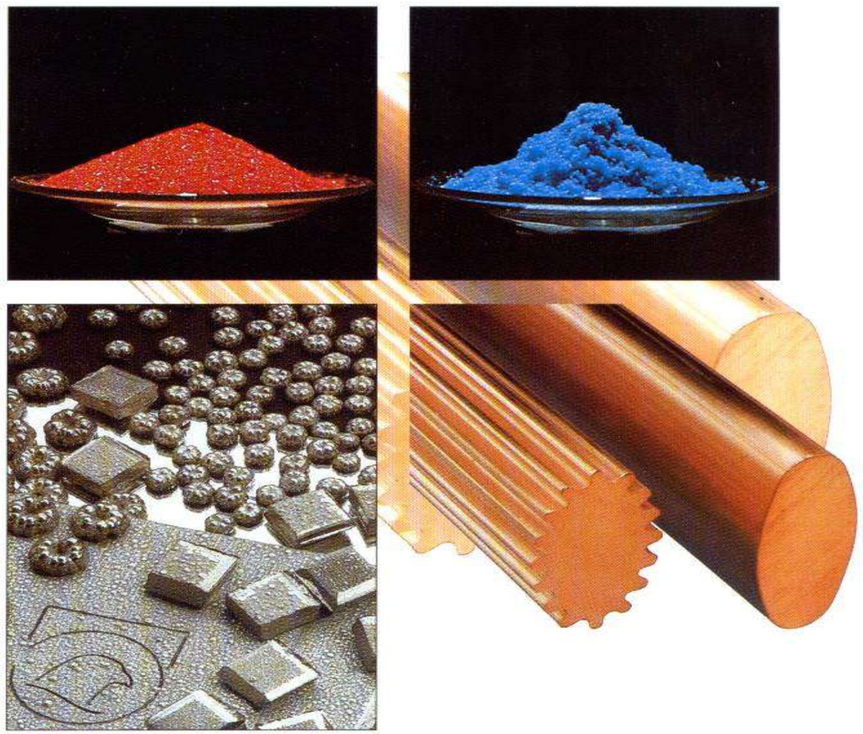
METALLCHEMIE
KIESOW GRUPPE

Grinding and polishing

Since our foundation – more than 85 years ago – we have developed and produced efficient buffing compounds and wheels. High-grade raw materials guarantee products of high performance.

- Buffing wheels / brushes
- Buffing compounds / sold and liquids
- Grinding belts and scotch tapes

Chemicals / Anodes



One of our main business is trading with basic materials. Our product range includes all common chemicals and anodes for electroplating.

Immediate availability is ensured by stock of many proucts.

Research and development

With a team of more than 15 engineers we continuously develop new products, optimize existing processes and improve manufacturing methods.

We meet our costumers demands by market analysis and constant improvement which are core elements of our company philosophy.

References


HELLA
Ideen für das
Auto der Zukunft


faurecia
Technical perfection, automotive passion.


JOHNSON
CONTROLS


KNORR-BREMSE


ISE


DORN
BRACHT


LEAR
CORPORATION

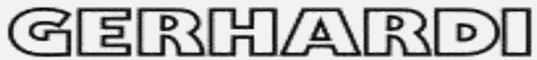

KIESOW


HANSA


DECOMA


METALLCHEMIE
KIESOW GRUPPE


hansgrohe
AXOR | PHÄRO


GERHARDI


KLUDI
Die Armaturenmacher


MAGNA
MAGNA DONNELLY


Miele
IMMER BESSER


BRAUN


KALDEWEI
Europas Nr. 1 in Badewannen


sedus


GESIKA


kusch co


Fissler

Agents / Distributors in CEE


PL – Metallchemie Polska Sp. Z o.o., Zabrze


HU – Metallchemie Magyarorszag Kft., Budapest


UA – Metallchemie Ukraine, Kiev


SLO – ALPKEM d.o.o., Kranj


CZ – FARAVELLI s.r.o., Praha


SK – GVS Slovakia s.r.o., Partizanske


RO – Metallchemie Magyarorszag, Sfantu Gheorge


SRB – AVANTI System, Nis


HR – LAKMUS d.o.o., Buzet


BIH – LAKMUS BH d.o.o., Lukavac


RUS – UTSK Ltd, Jekaterinburg

FERRO ČRTALIČ

All set for enamelling: Surface preparation by FerroECOBlast Europe

All set for enamelling:

From the raw material to perfect enamelled product

Matej Miklavčič
Marko Trajkovski
Bojan Črtalič

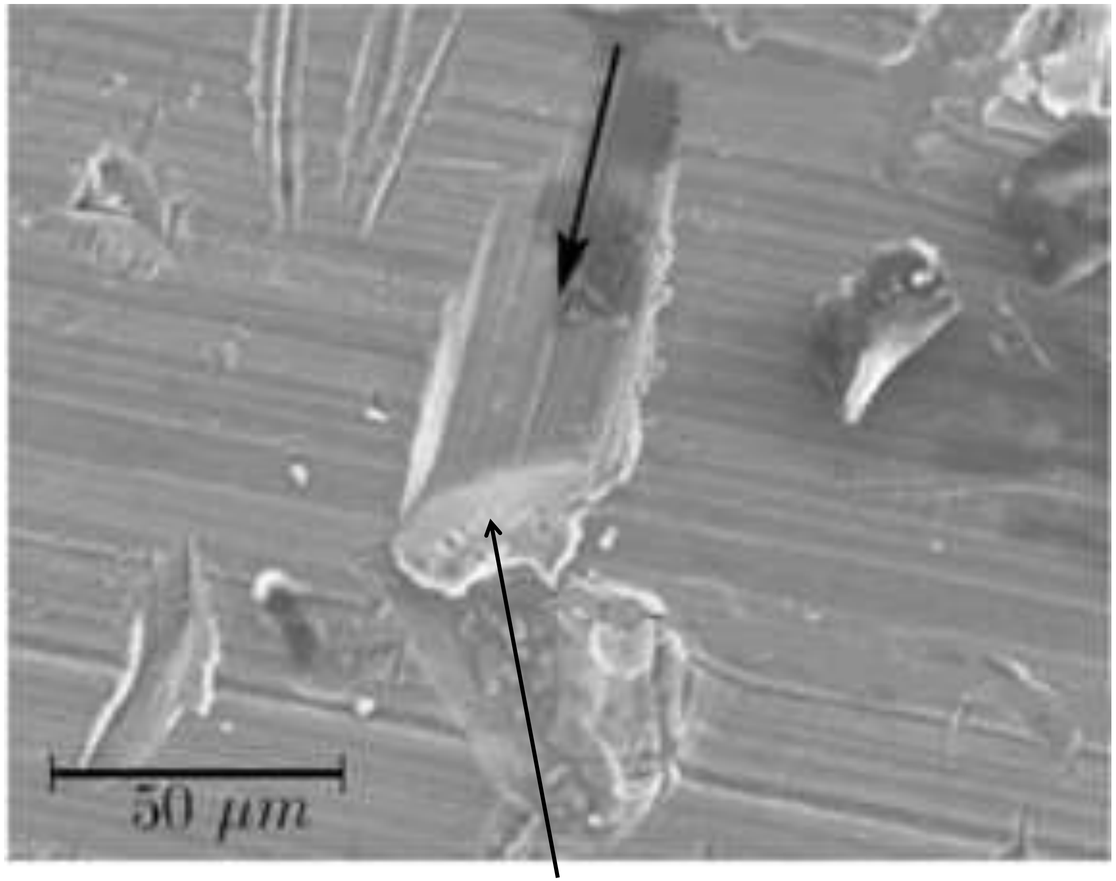
Portorož, 19.09. 2016

The most relevant = practical = critical problems that enamel plant enginners are facing today originate from:

1. *Lack of understanding the specifics of individual stages of enamelling process!*
2. *Inability to identify quality of process performance related to quality of the final products!*
3. *Difficulties in finding fast and accurate response once problems start to accumulate!*

Introduction: Mechanical surface preparation

Direction of abrasive grain motion

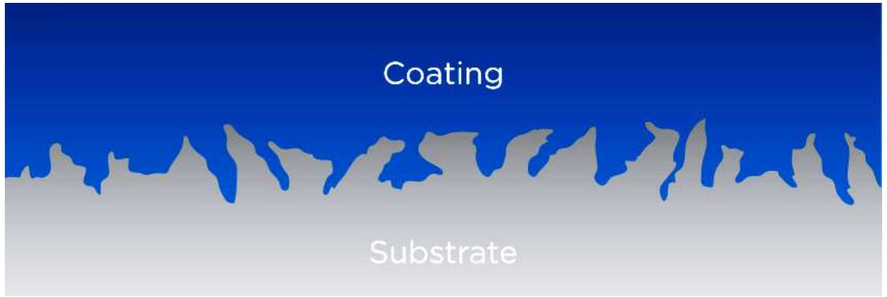


Pushed material

Raw substrate

Sand blasted substrate

Result:
MECHANICAL
ADHESION



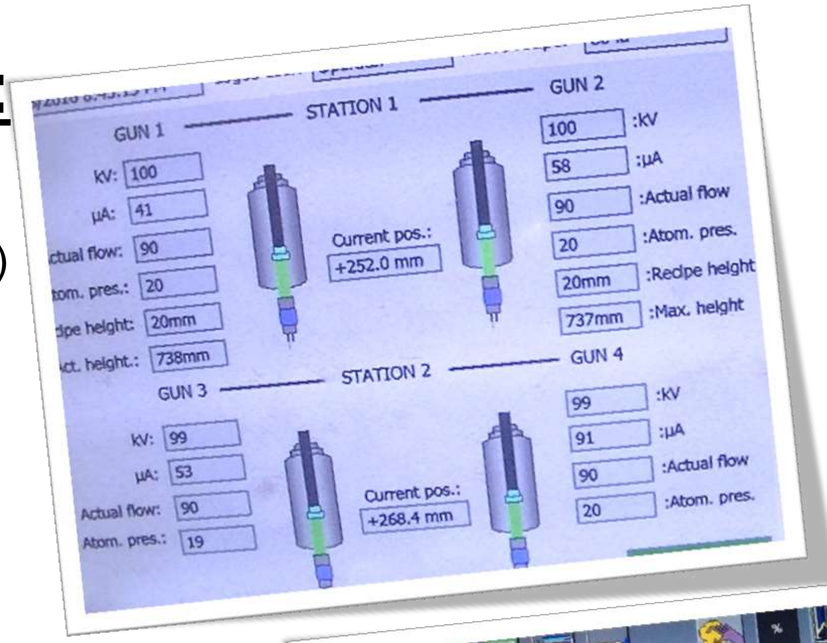
Key domains of quality enamel products

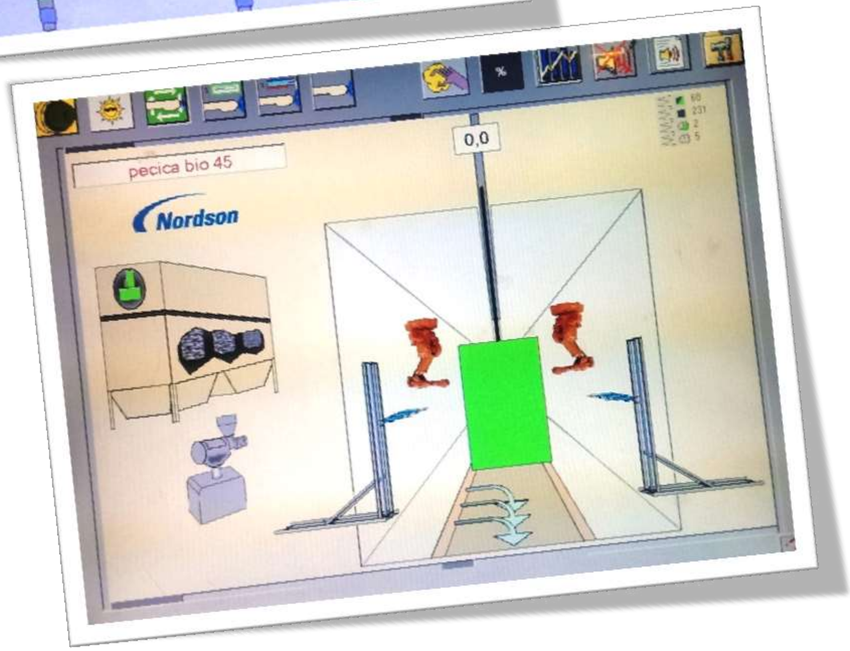
SUBSTRATE SELECTION:

- Cold or Hot rolled
- Mechanical properties
- Chemical composition

SURFACE PRETREATMENT:

- Chemical or Mechanical
- Roughness (Ra, Rz, PC)
- Cleanliness (Sa3)





FIRING:

- Furnace type
- Firing reaction process (metal oxidation, clay dehidration, frit softening, GC adherance , CC gloss firing)

APPLICATION:

- Wet (spraying, dipping, flooding)
- Electric Field (wet, dry powder, electroforetic)
- Drying

ENAMEL:

- Frit (milling, additions, quartz, agents, colouring)
- Ground or cover coat
- Conventional, Direct-on, combined (2c/1f)

Problems may origin from all the stages

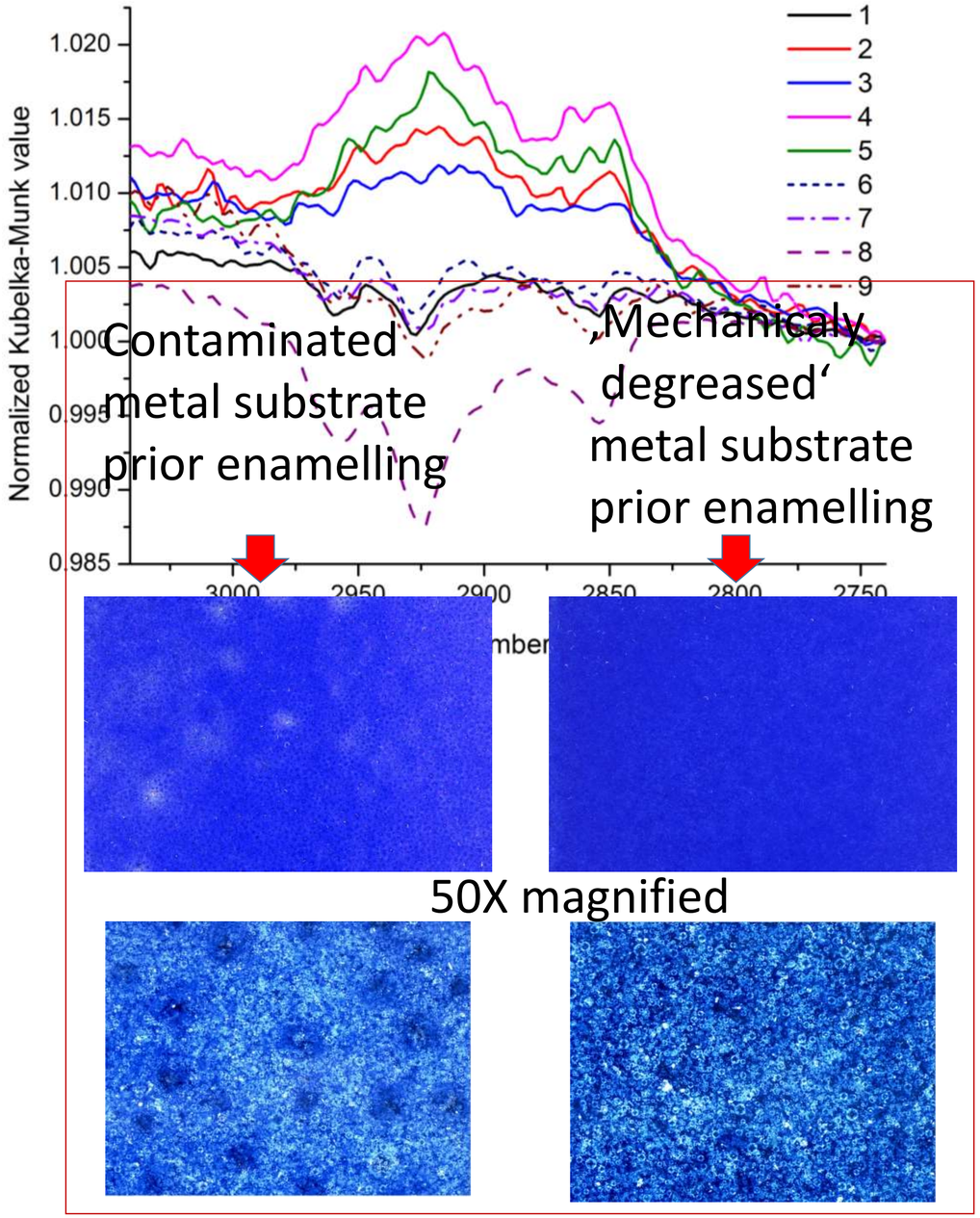
Enamel defects due to mill scale

Residual phosphate

Residual of (deep drawing) lubricant

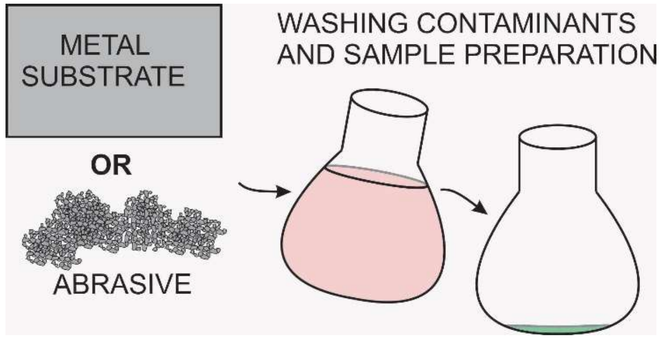
Improper rinsing …base residues (up) or acid residues (below)

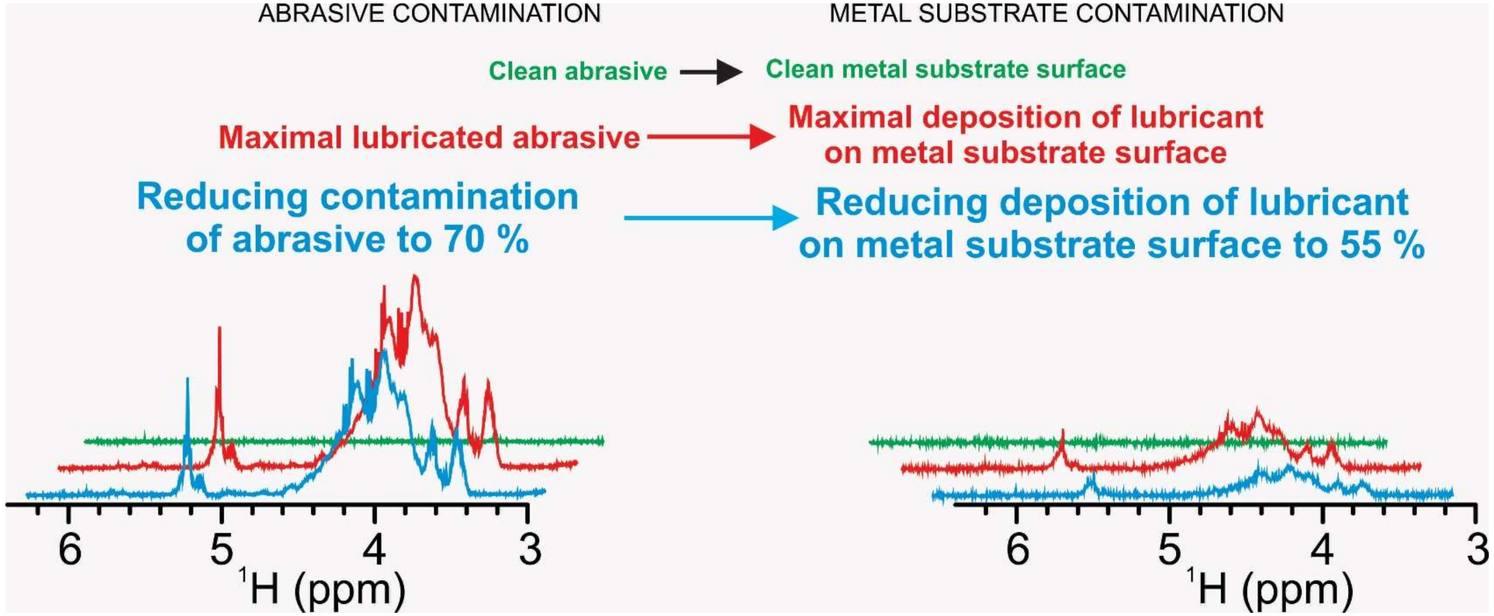
Mechanical degreasing



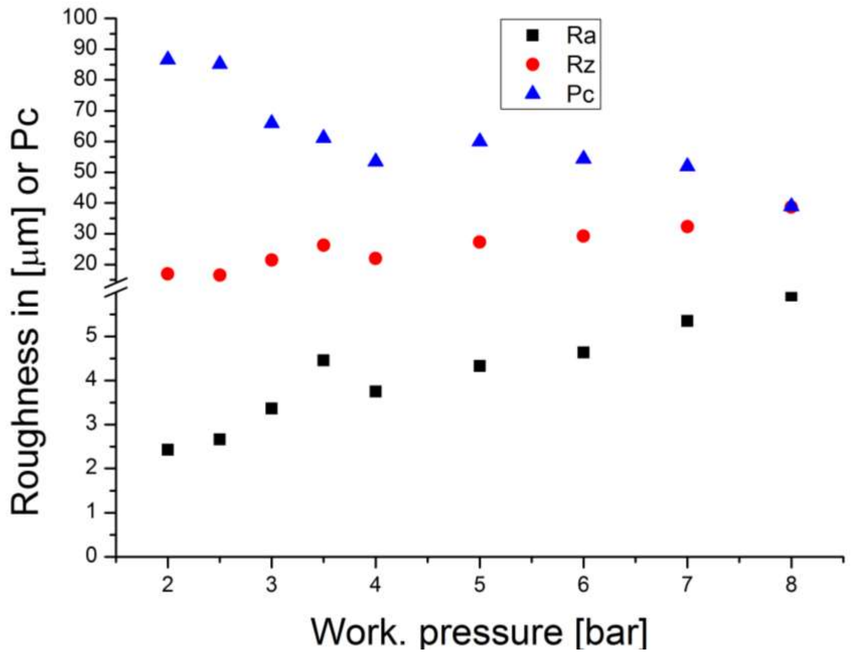
Experimental setup:

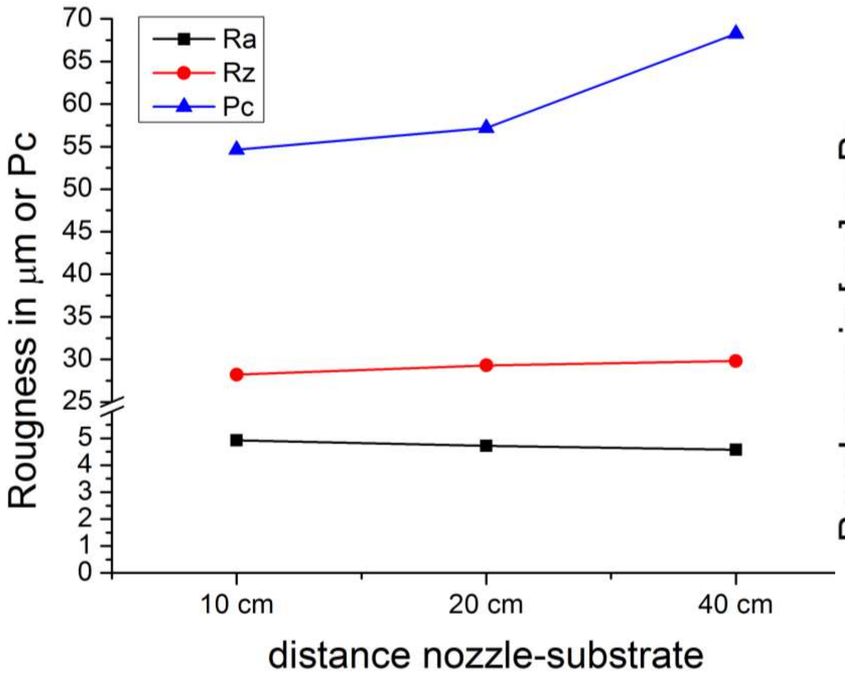
1. Controlled lubrication of shot blasting media (abrasive)
2. Shot blasting – mechanical degreasing
3. Analysis

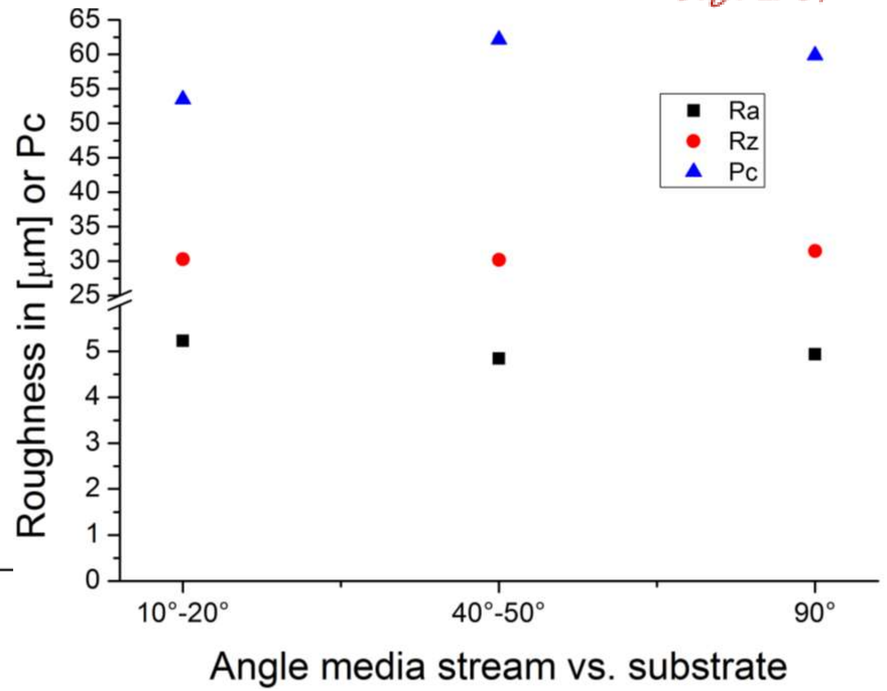


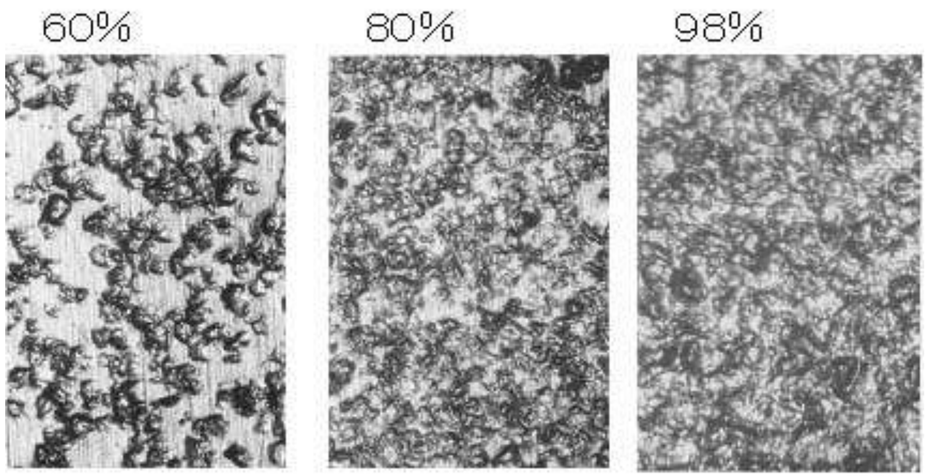


Sand blasting revisited



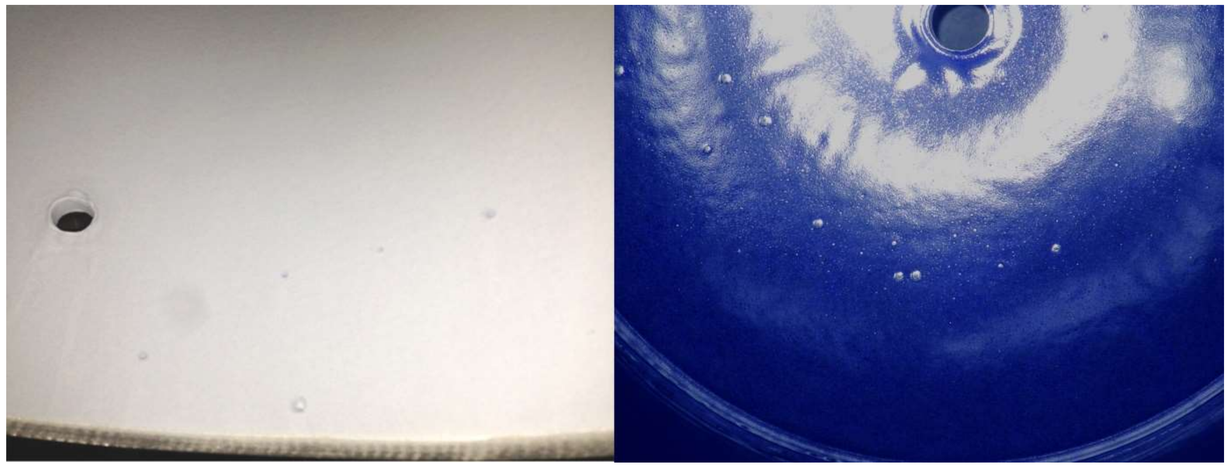




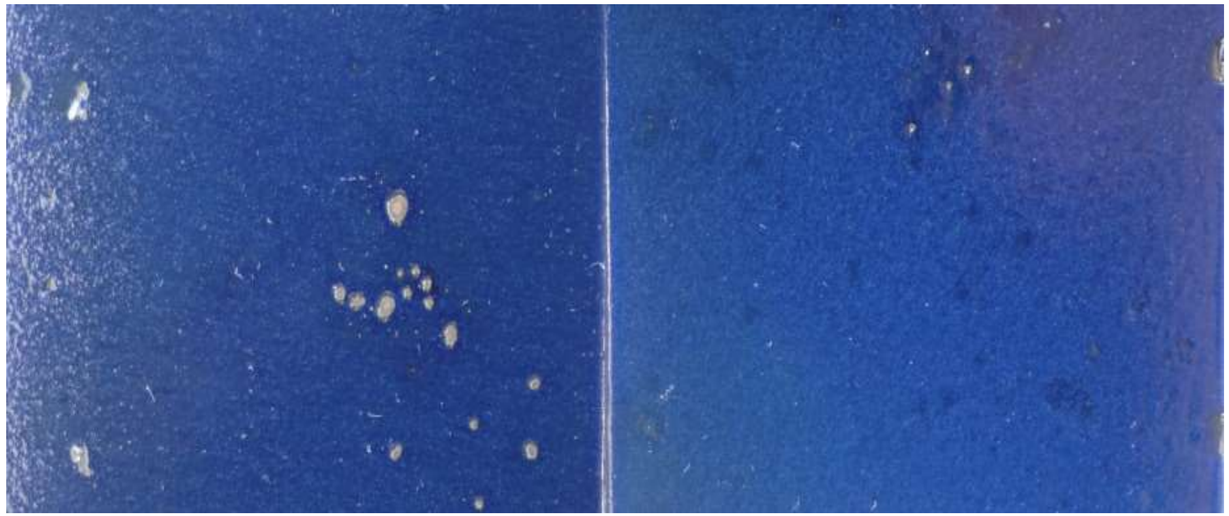


Keeping track of defects, performing test …gaining knowledge

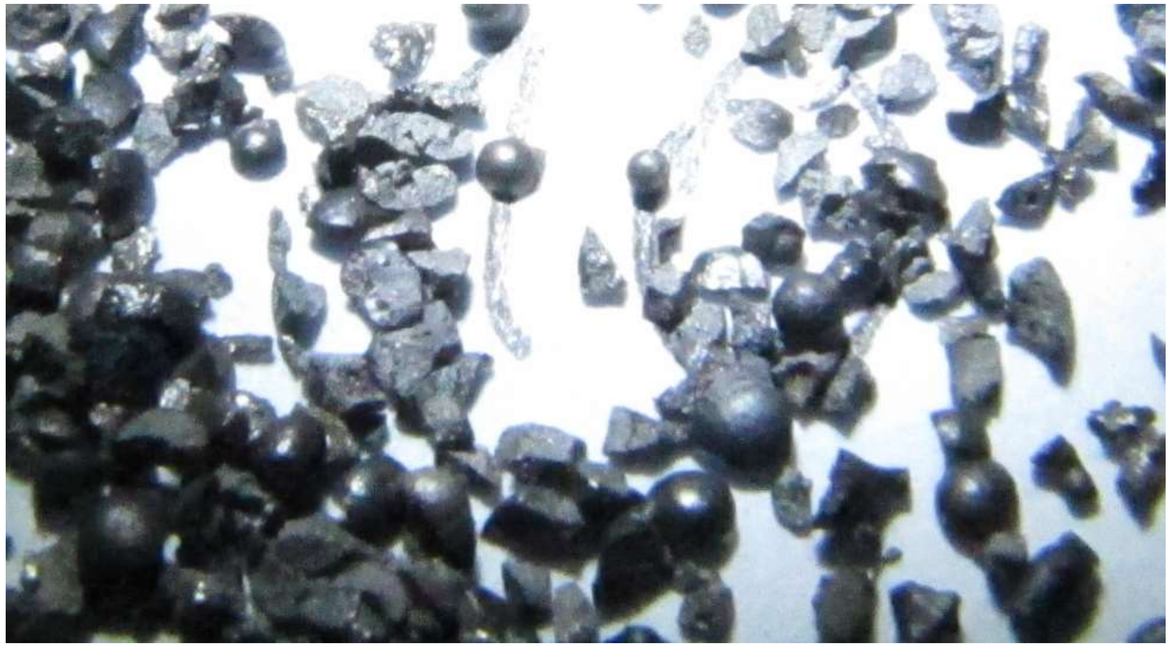
Preparing (or recycling) enamel slip can be tricky!



Optimise time between individual stages: substrate rusting after sand blasting



Rounded sand blasting media DO NOT ROUGHEN surface



BoilerBlast Machine Range:

- Considering: Product design, Working principle, Production volume, Enameling technology….

1. Single-Boiler machines
up to 3.000 l

2. Orbital machines
10 - 30 boilers/h

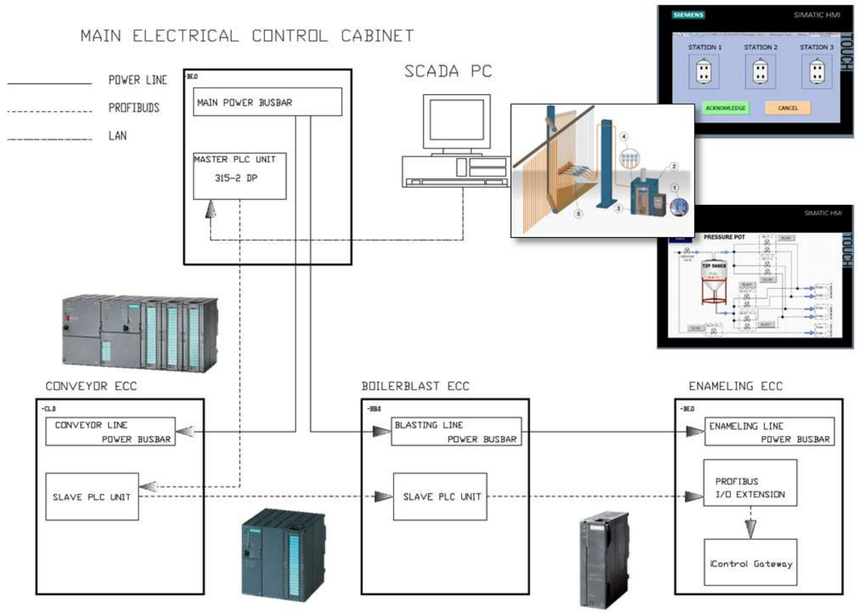
3. Through-Feed machines
40 – 120 boilers/h

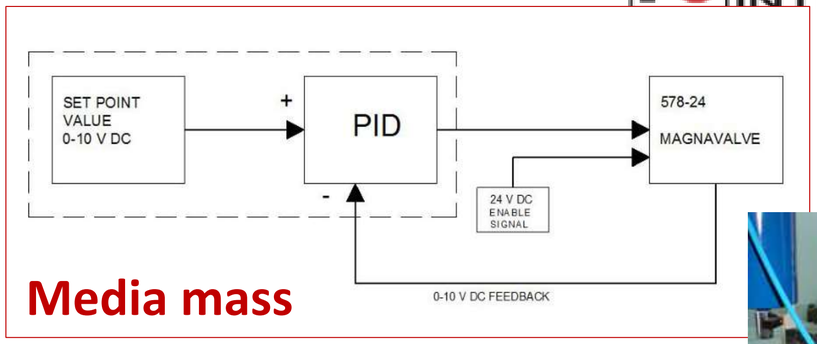
PARAMETER MANAGEMENT:
*how to influence and control key process variables?

- media size
- media type
- media hardness

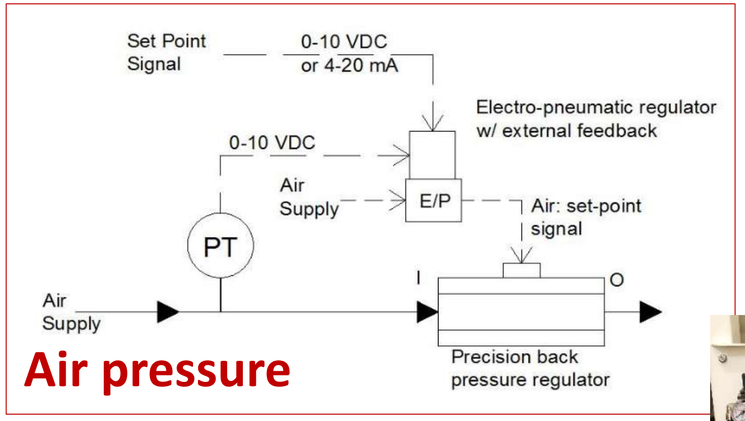
- media mass flow
- air pressure
- air quality
- exposure time
- blasting geometry

Integration of High Level Automation Systems

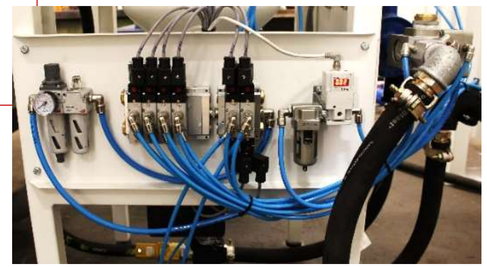




Media mass

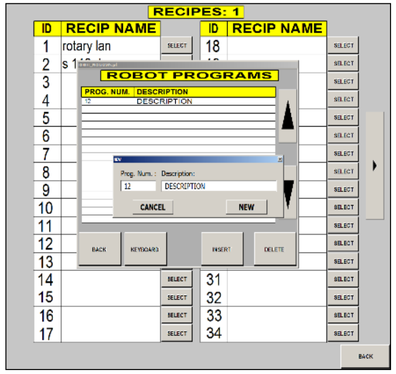


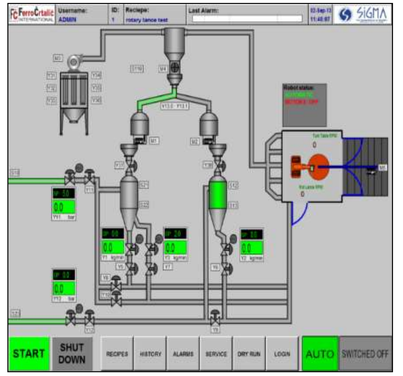
Air pressure



Integration of High Level Industrial Automation Systems

- Increased through output or **productivity.**
- Improved **quality** or increased predictability of quality.
- Improved robustness (**consistency**), of processes or product.
- Increased consistency of **output**.
- Reduced direct human **labor costs** and expenses.



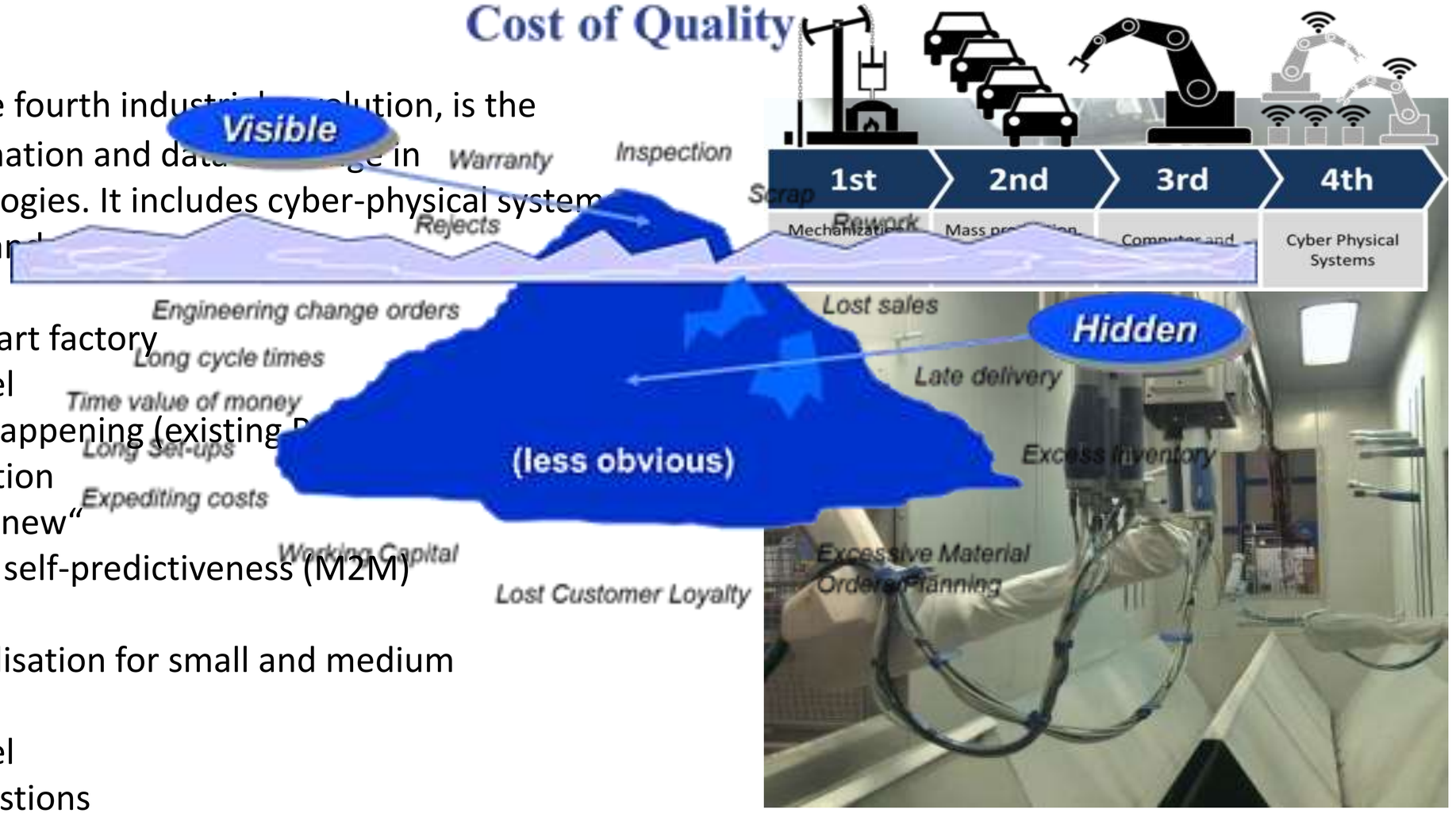


Machine & Process

Cost of poor quality => Future paradigm

Industry 4.0 or the fourth industrial revolution, is the current trend of automation and data exchange in manufacturing technologies. It includes cyber-physical systems, the Internet of things and

- New concept of Smart factory
- New business model
- Transition already happening (existing P
- Regional diversification
- Fear of „something new“
- Self-awareness and self-predictiveness (M2M)
- Security issues
- Difficult reindustrialisation for small and medium enterprises.. $$
- New business model
- Ethical & moral questions



Conclusions

- Global reference product
- Something For Everyone
- Utilisation of modern systems for process control for advance reliability and process management
- Universal solution of customers requirements
- Combined machine design (2 in 1)
- Total flexibility of universal solution for different range of applications

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Slovenia-Europe

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fax: +386 (0)7 38 45 115
info@ferrocrtalic.com
www.ferroECOblast.com

THANK YOU FOR ATTENTION!

CALDAN

Caldan Conveyor: The correct choice of the matching conveyor systems



CALDAN Conveyor A/S

Overhead Fördertechnik & Bodenförderer

Caldan - the company

Facts & figures:

- more than 40 years experience in the overhead & floor conveyor business
- turnkey solutions - from steel structure to control systems
- worldwide service & support of our systems
- more than 4.000 conveyors systems installed worldwide
- globally represented, subsidiaries in 3 countries

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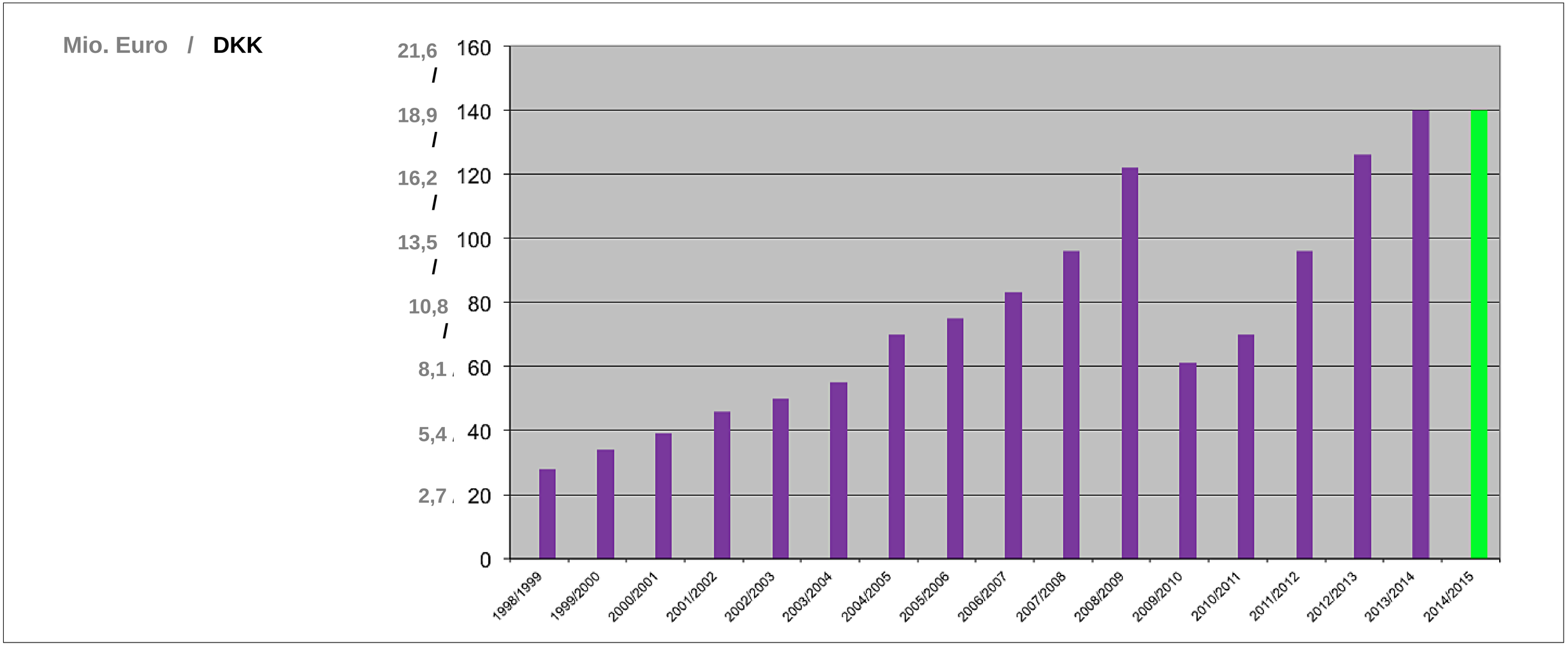
F. +49 6621 79579-59 • ler@caldan.dk

CALDAN GERMANY
Frankfurter Str. 7 • D-36251 Bad Hersfeld
T. +49 6621 79579-0 • info@caldan.dk

Denmark
headquarters & production
Germany
sales office & service
United Kingdom
sales office & service
France
sales office & service
Russia
strategic partnership

USA
strategic partnership, service & support
Latin America
sales representative
Brazil
strategic partnership
China
strategic partnership
India
strategic partnership


Mio. Euro / DKK
21,6 / 18,9 / 16,2 / 13,5 / 10,8 / 8,1 / 5,4 / 2,7
160
140
120
100
80
60
40
20
0
1998/1999
1999/2000
2000/2001
2001/2002
2002/2003
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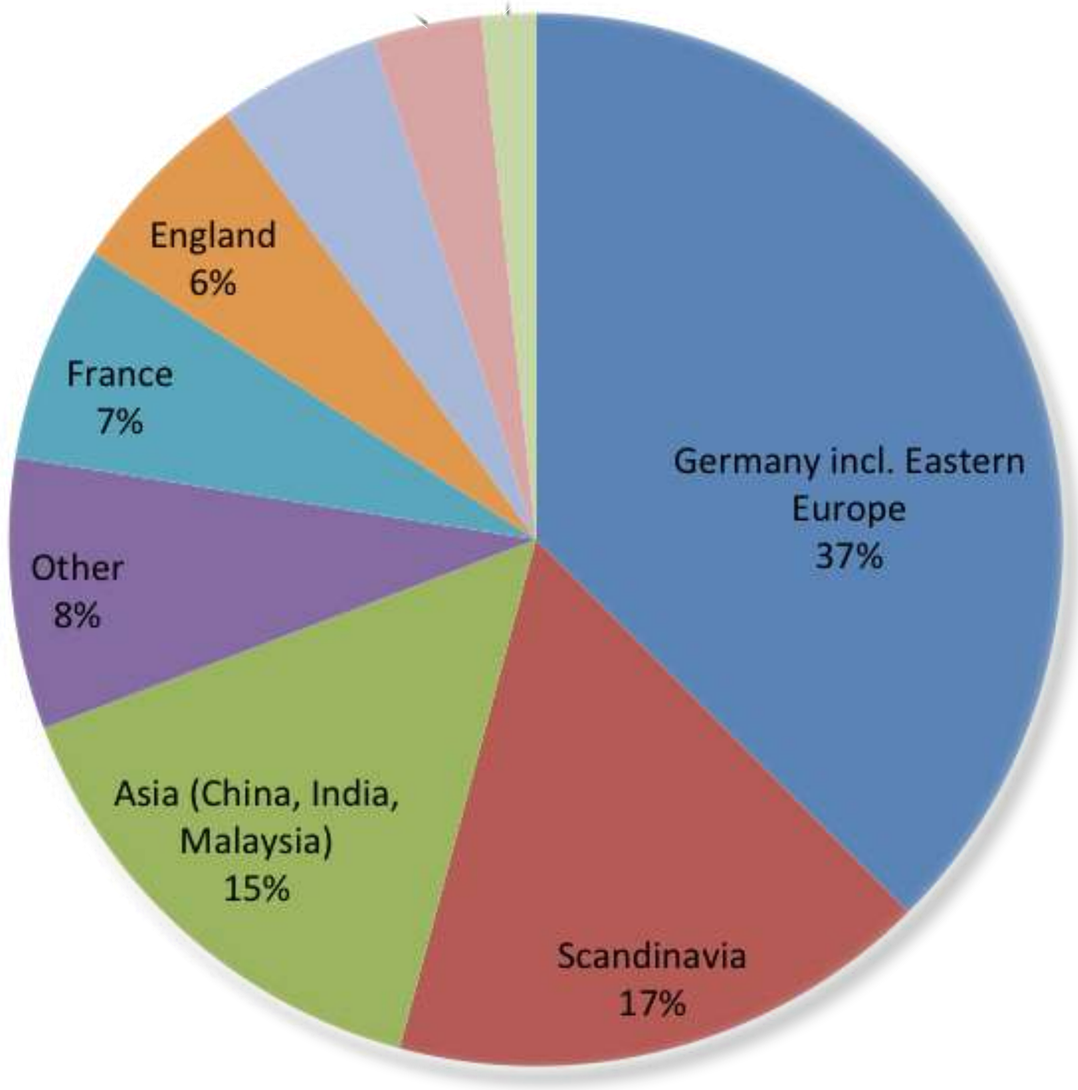
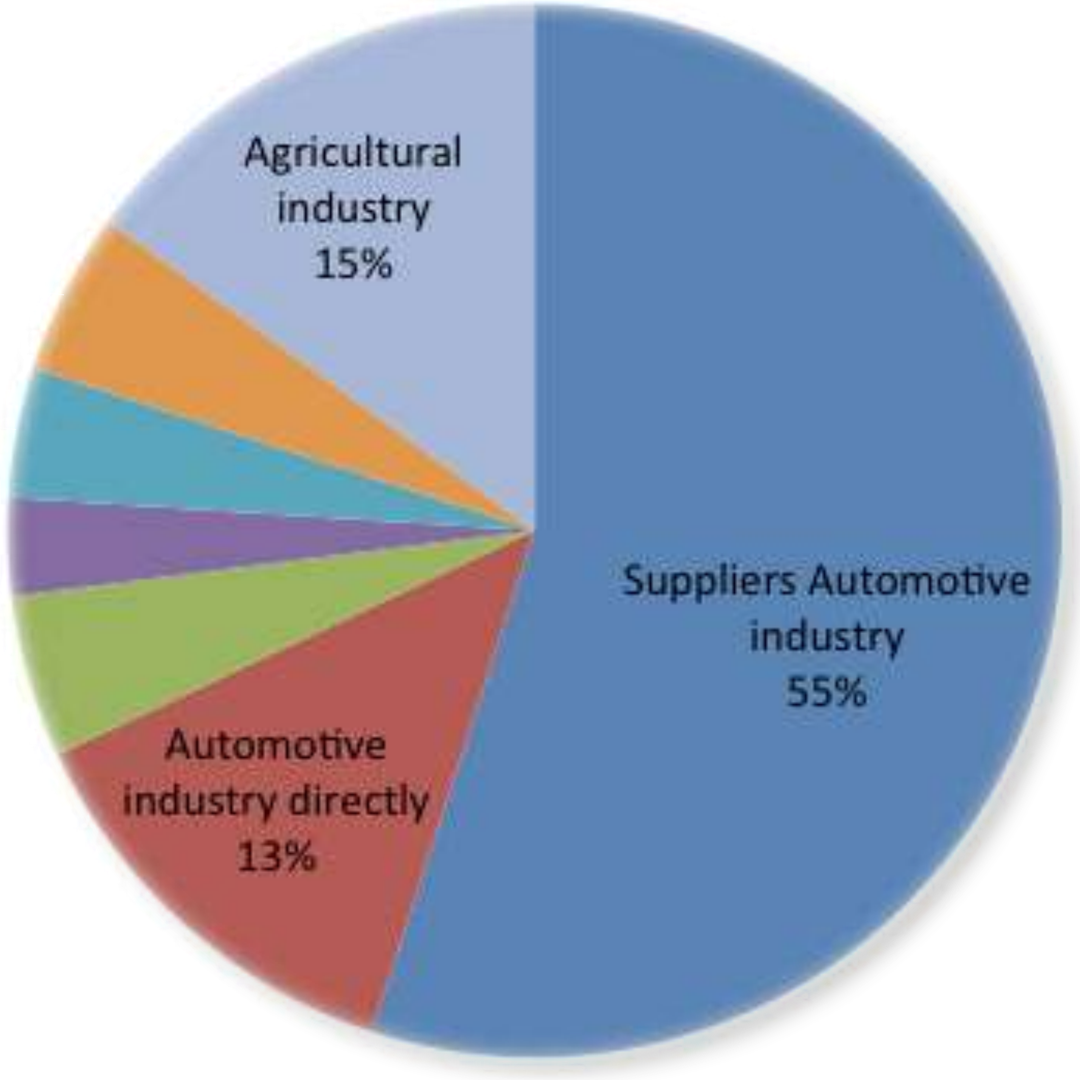
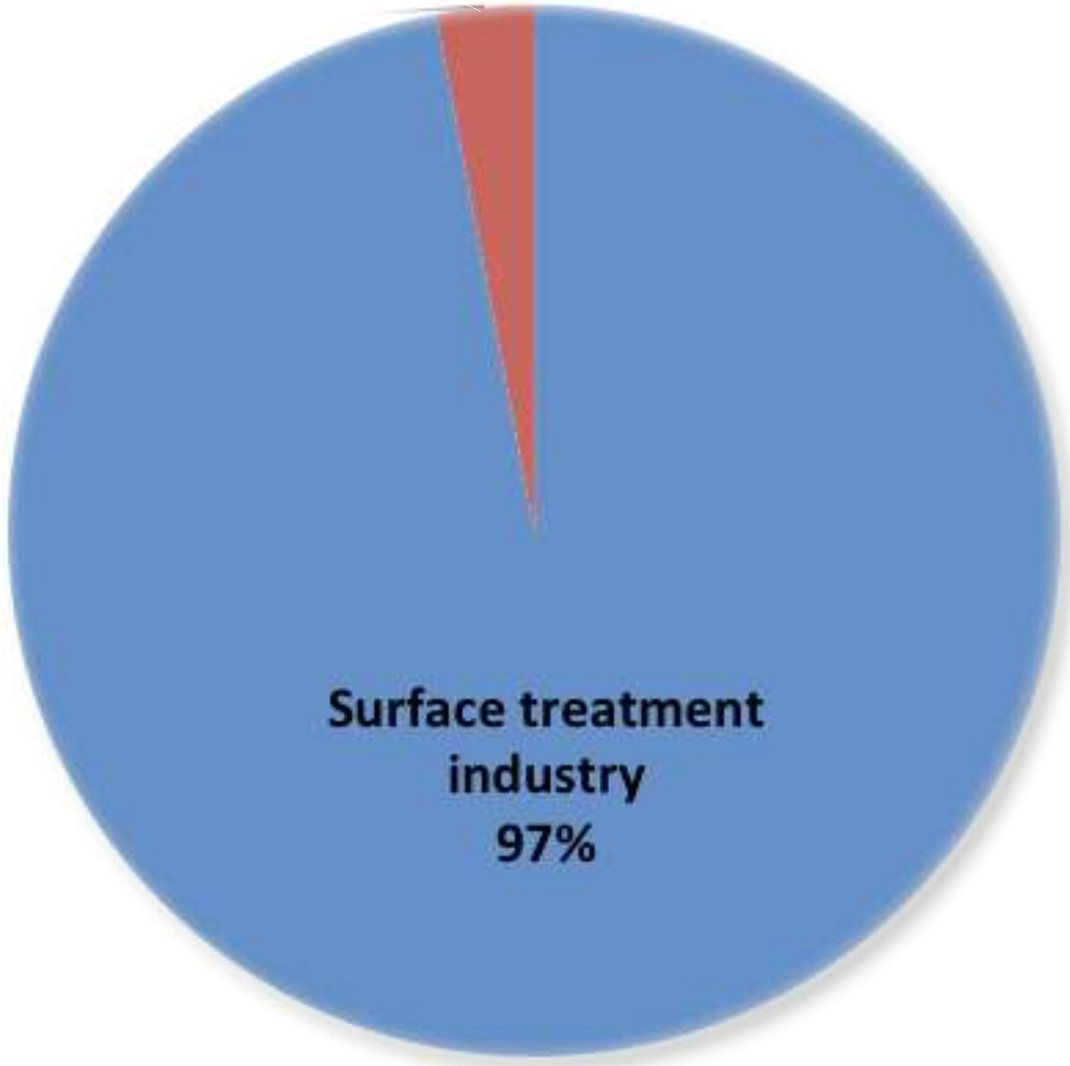
2009/2010
2010/2011
2011/2012
2012/2013
2013/2014
2014/2015


England
6%
France
7%
Other
8%
Germany incl. Eastern Europe
37%
Asia (China, India, Malaysia)
15%
Scandinavia
17%


Agricultural industry 15%
Suppliers Automotive industry 55%
Automotive industry directly 13%


Surface treatment
industry
97%

Referenzen

Kunststoffguss

Automobilindustrie

Referenzen...

Gießereien

ThyssenKrupp

ALCAN

Harz Guss Zorge GmbH

HEUNISCH GUSS

Düker

Häusliche Anwendungen

BOSCH

Miele

AEG

Electrolux

SIEMENS

Whirlpool

gorenje

Referenzen...

Holzindustrie

Fritz Hansen

VENJAKOB

STP Joinery Projects

WEINIG GROUP

skovby

KRUUNU
IKKUNAT JA OVET VUODESTA 1925

wrightjoinery

Verarbeitendes Gewerbe

Atlas Copco

Danfoss

ABB

ZEPRO

HUDEVAD

Kalmar

SIEMENS

KERMI

GRUNDFOS

auma

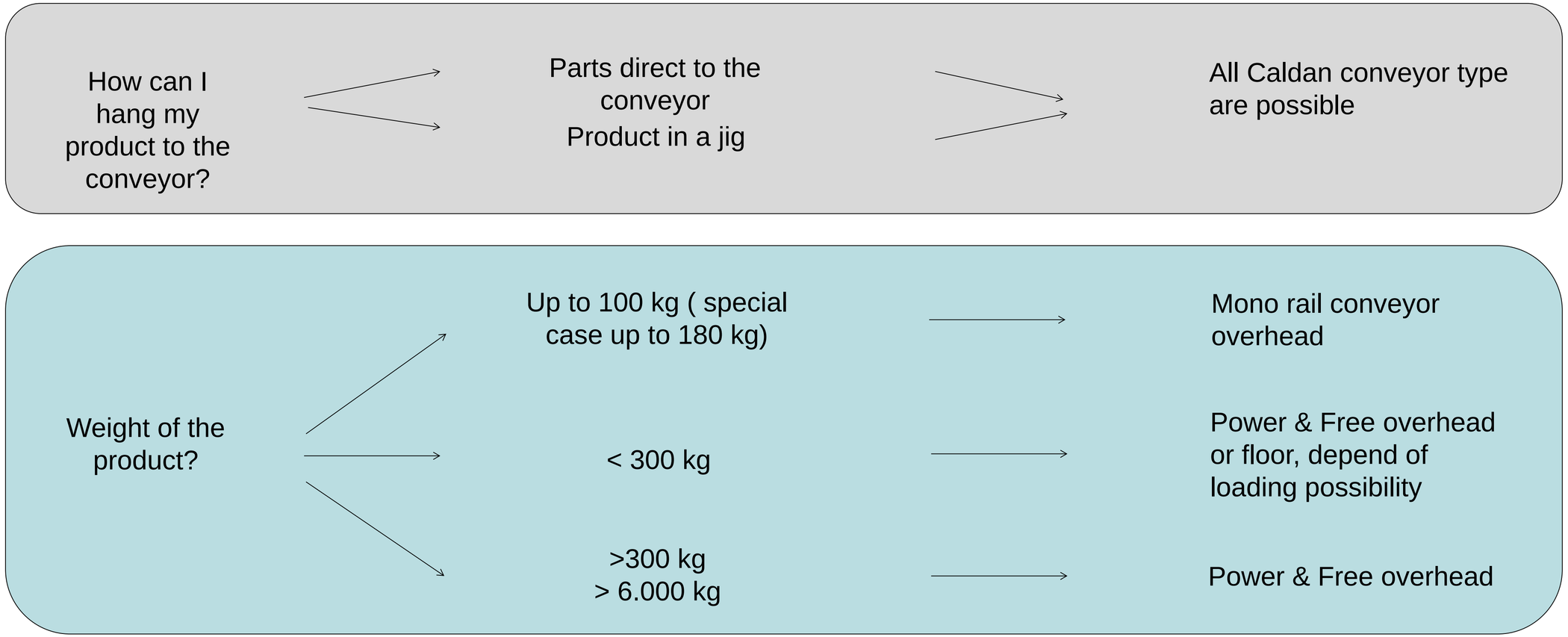
HORSCH

FRITZMEIER Group

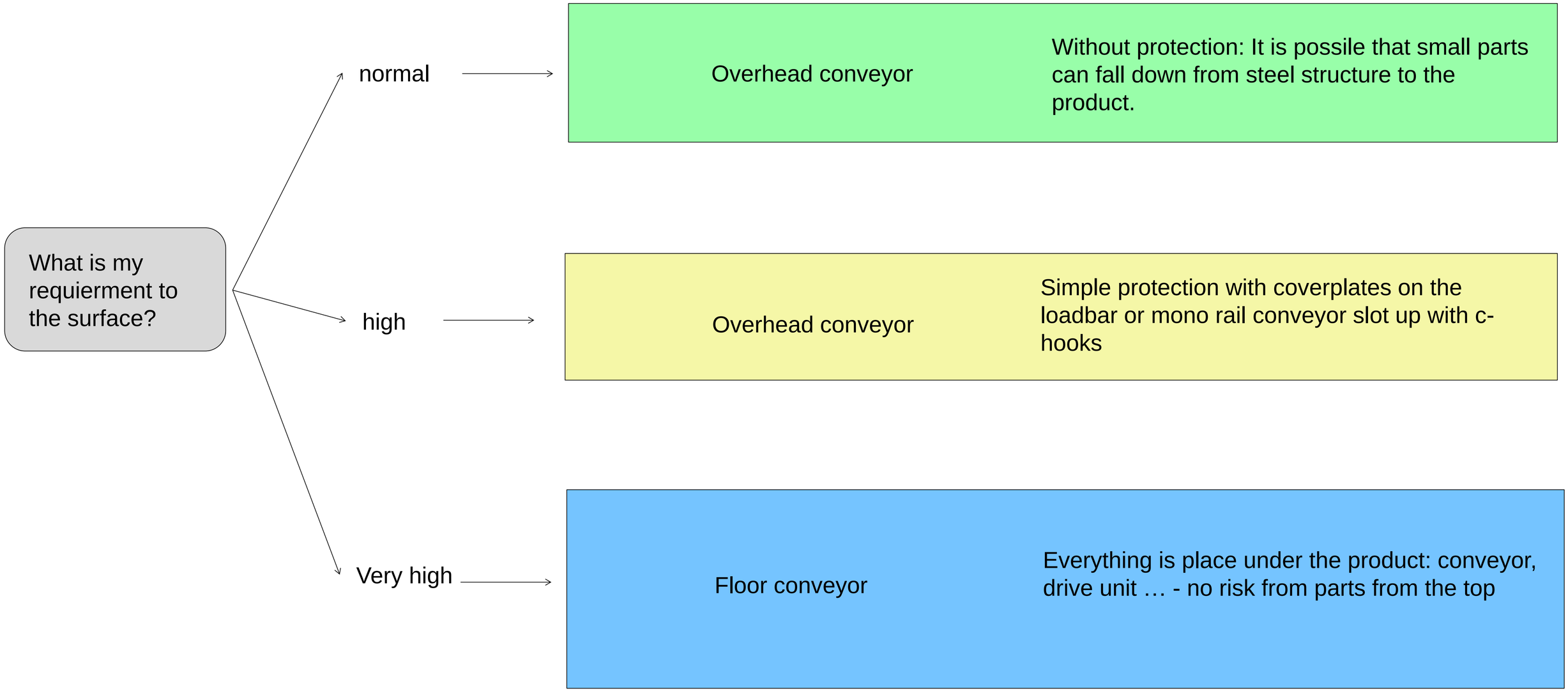
JCB

KM Karl Molin

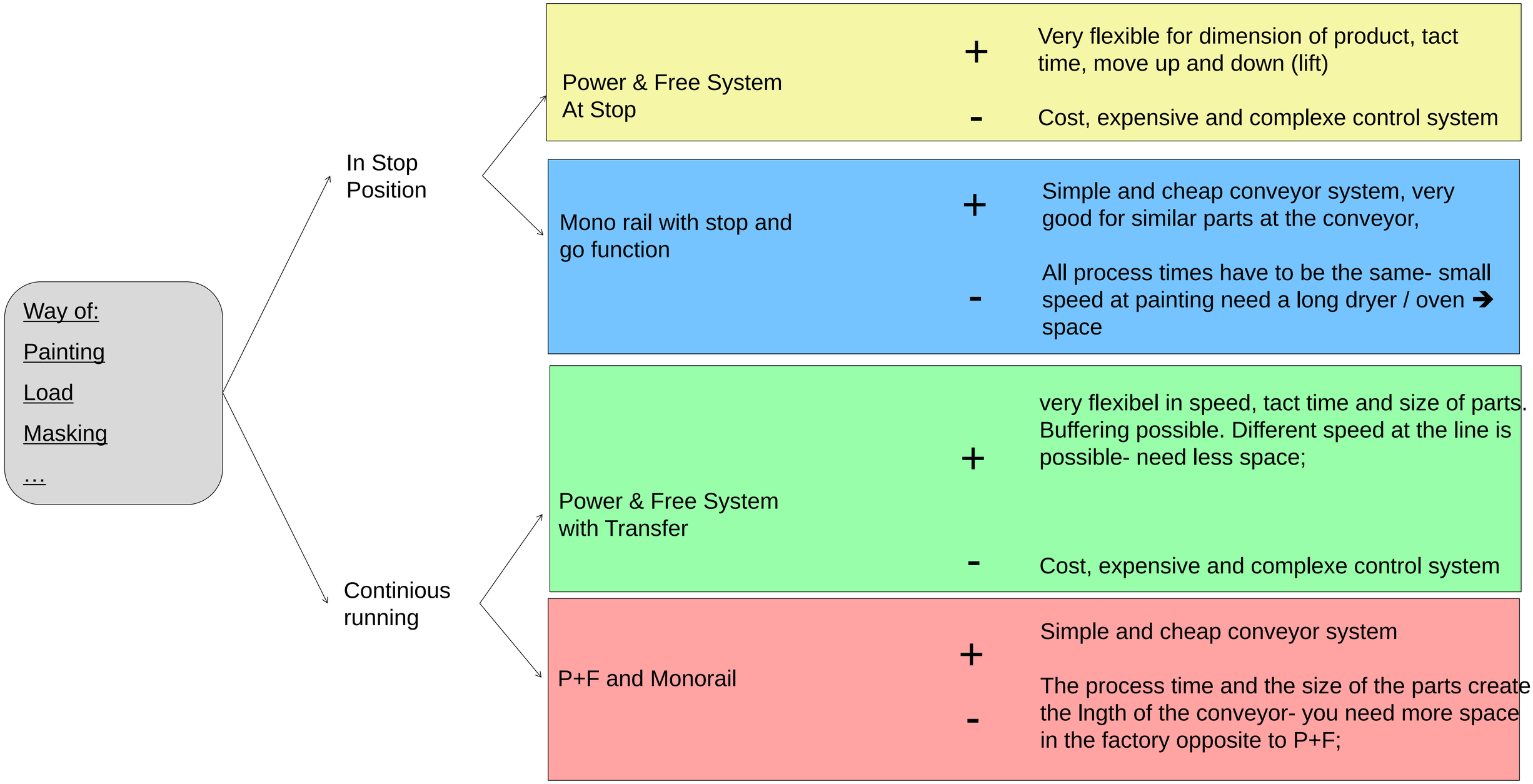
How do I find the right conveyor type for my application?



choise of the right conveyor



Auswahl der Fördertechnik



Auswahl der Fördertechnik

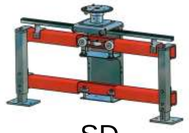
Weight of the product / Jig
< 300 kg

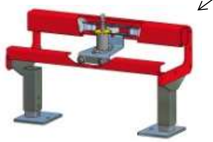
Floor-conveyor

High surface requierement

<1 kg | <5kg | < 20 kg | < 50 kg | > 50 kg

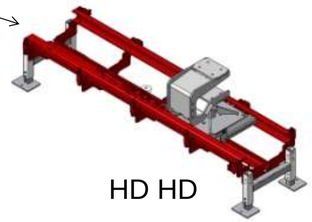

VLD

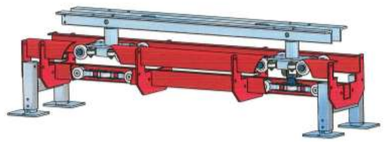

SD

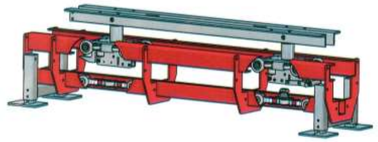

SDH


HD Stepper


HD 100 Kreisförderer


HD HD


PF 120 Power & Free


PF 100 Power & Free

Overhead-Conveyor

Normal surface requierement

Kontinuierlich | Stop and Go | Power & Free

<90 kg | <180kg | <300 kg


Single C - Haken


Single Sägezahn-Abhängung


Single Standard


PF 380

Auswahl der Fördertechnik

Weight of product / Jig
> 300 kg

Overhead-Conveyor

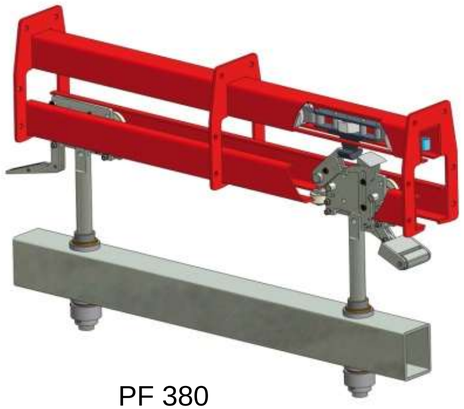
high surface requierement

Very high surface requierement:

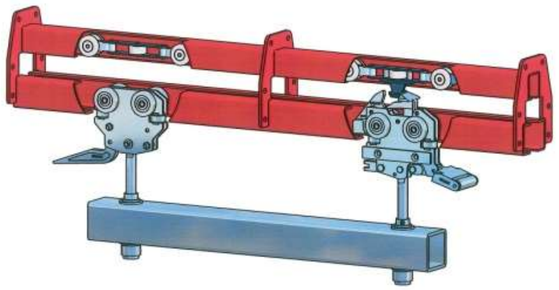
Dip trays at the loadbar

Cleaning systems for wagons

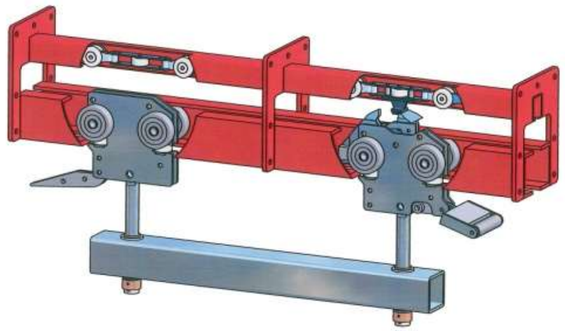
Chain with closed bearing-



PF 380
< 300 kg



PF 400
< 2000 kg



PF 420
< 6.000 kg

Bodenförderer

Projekt:
Oberflächenbehandlung - Autoteile
Austellungsort:
England
Fördersystem:
P&F100 - Power&Free

ADAC AUTOMOTIVE

P&F100

Case story / PaintBox

Oberflächenbehandlung - Teile für high end Autos:

Angaben zur Projektierung :
Endkunde: ADAC Paintbox Limited
Aufstellungsort: Banbury, GB

Art der Teile:
Teile für Autos

Teileabmessungen (L x W x H):
2,000 x 700 x 900 mm
Gewicht der Teile: 50 kg
Taktzeit: 200/250 sek.

Fördergeschwindigkeit:
6.0 m/min
Kapazität: 18 Gehänge / Stunde

Auf- bzw. Abnahme der Teile:
manuell

Eingesetztes Fördersystem:
Typ: P&F100 - Bodeförderer
Kettentyp: Kardankette
Kettenteilung: 180 mm.
Kettenlänge, total: 113 m.

P&F100 im Einsatz

P&F100 im Einsatz

P&F100 im Einsatz

Kunde & Produkte

Bodenförderer

Projekt:
Oberflächenbehandlung - Fahrzeug Innenteile
Austellungsort:
Deutschland
Fördersystem:
HD100

HD100

Case story / Volkswagen

LACKIERANLAGE, FAHRZEUG INNENTEILE:

Angaben zur Projektierung:

Endkunde: VW-Braunschweig
Aufstellungsort: Braunschweig, Deutschland
Art der Teile: Kunststoffteile
Teileabmessungen:
- 1600 x 1000 x 1300 mm
- 1140 x 1000 x 1300 mm

Teilegewicht:
max. 70 kg pro Transporteinheit
die Transporteinheiten sind für 100 kg ausgelegt)

Taktzeit: 1,25 min

Fördergeschwindigkeit:
1,3 m/min bis 2,8 m/min

Eingesetztes Fördersystem:

Typ: Caldan Bodenförderer HD100
Kettenart: Kardankette
Kettenteilung: 270 mm
Gehängeteilung: 1620 mm
Einsatzbereich: Temp. max. 100°C

HD100 im Einsatz

HD100 im Einsatz

Caldan HD100 - Bodenkreisförderer

HD100 im Einsatz

Kunde & Produkte

Bumper mit dem HD 140

HD 140

Bodenförderer

Projekt:
Oberflächenbehandlung - Helme und Skibrillen
Austellungsort:
Deutschland
Fördersystem:
HD100

uvex

HD100

Case story / Uvex

LACKIERANLAGE, HELME UND SKIBRILLEN:

Angaben zur Projektierung:
Endkunde: Uvex
Aufstellungsort: Deutschland
Art der Teile: Helme / Brillen etc.
Gehängeabmessungen (Durchm. x h):
300 x 250 mm

Gewicht des Gehänges:
max. 30 kg pro Traverse

Taktzeit: unbekannt
Fördergeschwindigkeit:
2,1 m/min, regelbar 0,6 - 3 m/min

Auf- bzw. Abnahme / Übergabe der Teile:
manuell im Durchlauf

Drehung im Lackieren:
motorisch im Durchlauf, ca. 80/ min

Eingesetztes Fördersystem:
TYP: Caldan HD 100
Kettenart: Kardankette
Kettenteilung: 180 mm
Mitnehmerabstand (Wagen): 1260 mm
Spindelabstand: 420 mm
Einsatzbereich: Temp. max. 90°C

HD100 im Einsatz

HD100 im Einsatz

HD100 im Einsatz

Kunde & Produkte

Bodenförderer

Projekt:
Oberflächenbehandlung - Pumpenteile
Austellungsort:
Dänemark
Fördersystem:
SD

GRUNDFOS

SD

Case story / Grundfos

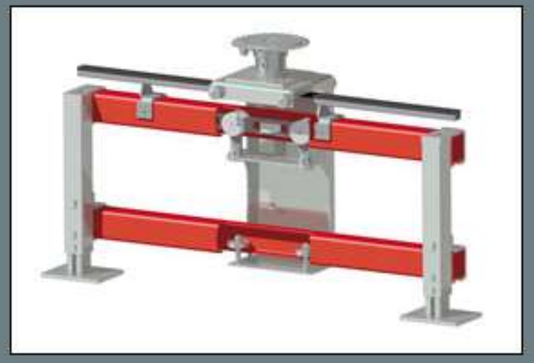
OBERFLÄCHENBEHANDLUNG VON PUMPENTEILE:

Angaben zur Projektierung:
Endkunde: Fa. Grundfos
Aufstellung - Ort: Bjerringbro, Dänemark
Art der Teile: Pumpen
Teileabmessungen: 250 x 250 x 200 mm
Teilegewicht: max. 15 kg
Fördergeschwindigkeit: 2,5 m/min
Auf- bzw. Abnahme der Teile:
- bauseitige Roboter

Drehung im Lackierbereich:
motorisch 60U/min auf 4 m Länge
Drehen Abdunstzone:
mechanisch ca. 4000 mm - Arretierung 0°
Genauigkeit:
in den Führungen seitlich +/- 1,5 mm
am Wagenflansch.
Antriebe:
Antrieb nach der Kabine / in der Nähe der automatischen Aufgabe

Eingesetztes Fördersystem:
TYP: Caldan SD
Kettenart: Kardankette
Kettenteilung: 180mm
Wagen/Teileabstand: 360mm
Einsatzbereich: Temp. max. 120°C

SD im Einsatz



Caldan SD - Bodenkreisförderer

SD im Einsatz

Kunde & Produkte

Bodenförderer

Projekt:
Oberflächenbehandlung - Unterhaltungselektronik
Austellungsort:
Deutschland
Fördersystem:
P&F120 - Power&Free

P&F120

Case story / Metz

OBERFLÄCHENBEHANDLUNG VON UNTERHALTUNGS ELEKTRONIK:

Angaben zur Projektierung:
Endkunde: Metz-Werke GmbH & Co KG
Aufstellungsort: Zirndorf, Deutschland

Art der Teile: Kunststoffteile
Gehängeabmessungen (L x B):
1300 x 700 x 1000mm

Gewicht des Gehänges: ca . 20 kg
Taktzeit: Normal 1 min
Fördergeschwindigkeit: getaktet

Auf- bzw. Abnahme der Teile:
manuell im Taktbetrieb

Eingesetztes Fördersystem:
Typ: Caldan POWER + FREE 120
Kettenart: Kardankette
Kettenteilung: 270mm
Mitnehmerabstand: 1890mm

Laufwagen: 2-fach Laufwerk
Laufwagenpuffermass: längs: 900mm
Einsatzbereich: Temp. max. 80°C

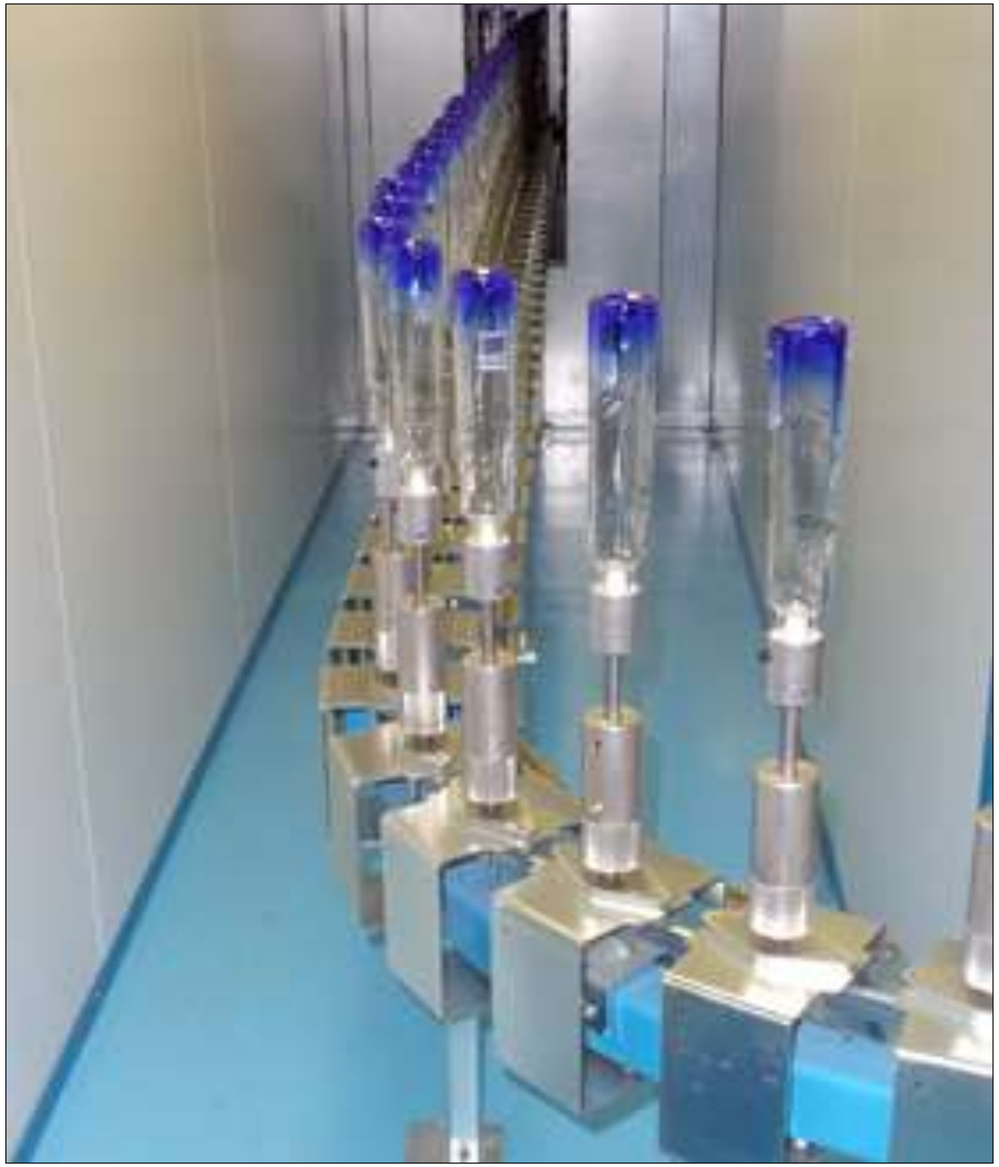
P&F120 im Einsatz

P&F120 im Einsatz

P&F120 im Einsatz

Kunde & Produkte

Bodenförderer



Projekt:
Oberflächenbehandlung - Glasflaschen
Austellungsort:
England
Fördersystem:
LD

STÖLZLE-OBERGLAS

LD

Case story / Stoelzle

Oberflächenbehandlung - Glasflaschen:

Angaben zur Projektierung:
Endkunde: Stoelzle Flacconage Ltd.
Aufstellungsort: GB / Knottingley
Art der Teile:
Glasflaschen

Teileabmessungen (L x W x H):
75 x 75 x 400 mm

Gewicht der Teile: 2 kg
Fördergeschwindigkeit: 4.0 m/min
Kapazität: 26 Wagen / Minute

Auf- bzw. Abnahme der Teile:
manuell

Eingesetztes Fördersystem:
Typ: LD - Bodenförderer
Kettentyp: S150-90
Kettenteilung: 150 mm

LD im Einsatz

LD im Einsatz

LD im Einsatz

LD im Einsatz

Kunde & Produkte

Bodenförderer

Projekt:
Oberflächenbehandlung - Kraftstofftanks
Austellungsort:
China
Fördersystem:
HD100

TAYO

HD100

Case story / Tayo

OBERFLÄCHENBEHANDLUNG - KRAFTSTOFFTANKS FÜR MOTORRÄDER:

Angaben zur Projektierung:
Endkunde: Tayo Motor

Aufstellungsort:
Guangdong, China

Art der Teile:
Kraftstofftanks für Motorräder

Gewicht des Gehänges, max:
32 kg.

Taktzeit: 0,5 min. / Laufwagen

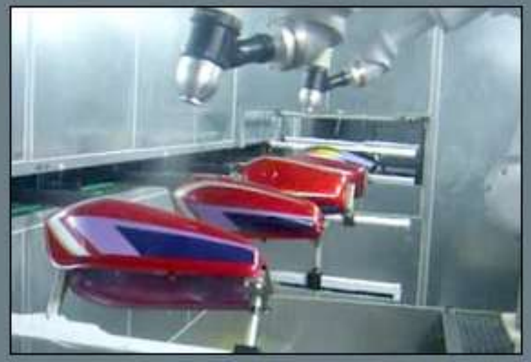
Fördergeschwindigkeit:
2,4 m/minute - variabel

Produktionskapacität:
144 Laufwagen / Stunde

Auf- bzw. Abnahme der Teile:
Manuell im Durchlauf

Eingesetztes Fördersystem:
Typ: HD100 - Bodenförderer
Kettentyp: Kardankette
Kettenlänge: 89 m.

HD100 im Einsatz

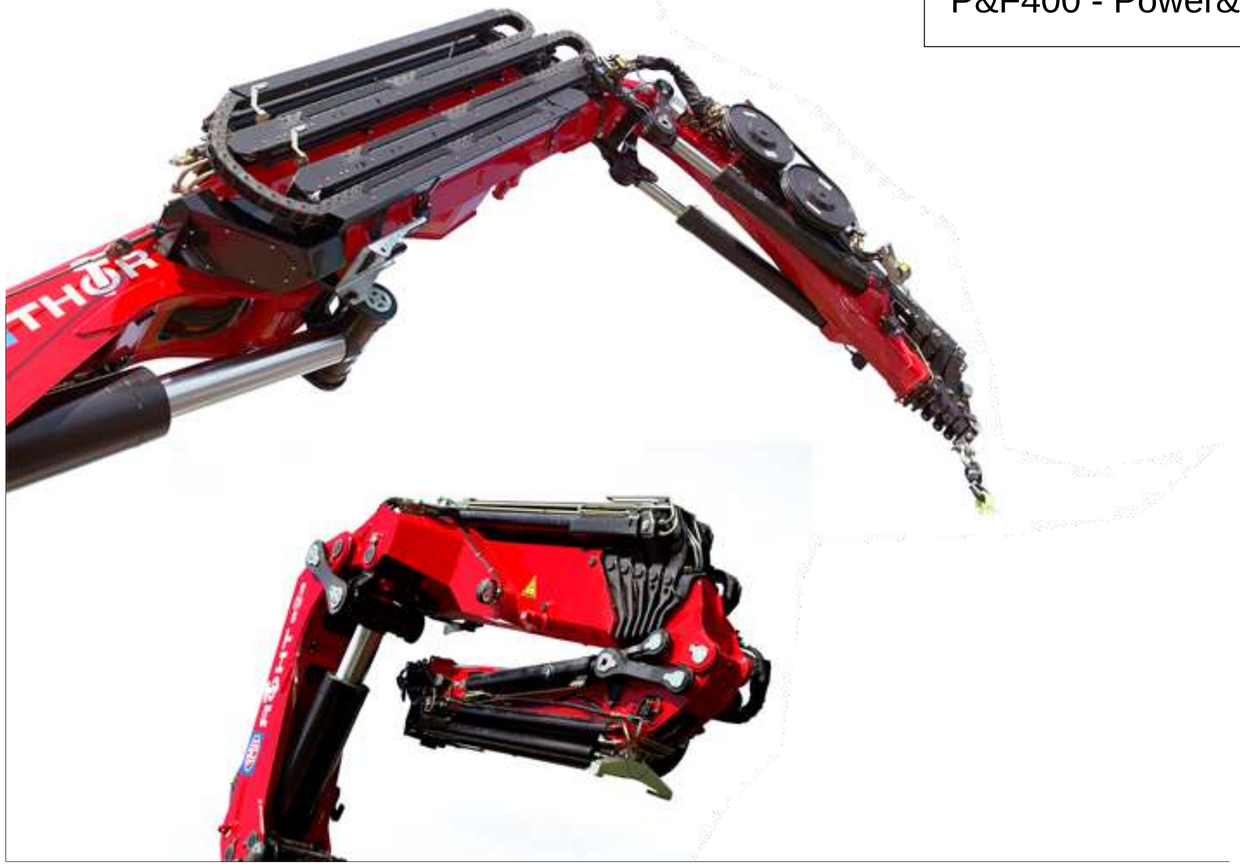


HD100 im Einsatz

Kunde & Produkte

Overhead conveyors

Projekt:
Oberflächenbehandlung - Teile für Krane
Austellungsort:
Dänemark
Fördersystem:
P&F400 - Power&Free



P&F400

Case story / HMF

Oberflächenbehandlung - Teile für Krane:

Angaben zur Projektierung:
Endkunde: Højbjerg Maskinfabrik (HMF)
Aufstellungsort: Højbjerg - Dänemark

Art der Teile: Teile für Krane
Teileabmessungen (L x B x H):
3500 x 1500 x 1500 mm

Teilegewicht, max: 1500 kg
Teilegewicht, durchschnitt: 300 kg
Taktzeit: 5 min
Fördergeschwindigkeit: 0,5-2,0 m/min
Kapazität pro Stunde: 12 Teile

Auf- bzw. Abnahme der Teile:
manuell

Eingesetztes Fördersystem:
Typ: P&F400 - Power&Free Förderer
Kettentyp: S270 - Kardankette
Kettenteilung: 270 mm
Kettenlänge, total: 1.030 m.

P&F400 im Einsatz

P&F400 im Einsatz

P&F400 im Einsatz

P&F400 im Einsatz

Kunde & Produkte

Overhead conveyors

Projekt:
Oberflächenbehandlung - Stanzmaschinen
Austellungsort:
Schweiz
Fördersystem:
P&F420 - Power&Free

BRUDERER

P&F420

Case story / Bruderer

OBERFLÄCHENBEHANDLUNG VON STANZMASCHINEN:

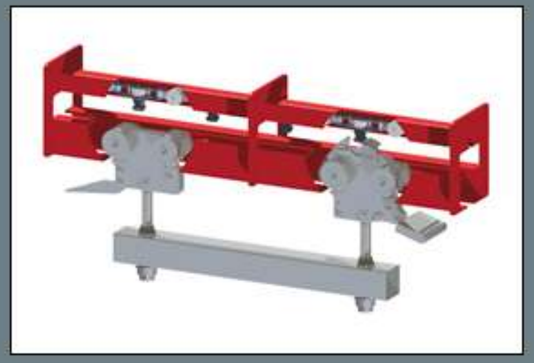
Angaben zur Projektierung:
Endkunde: Bruderer AG Frasnacht
Aufstellungsort: Schweiz
Art der Teile: Teile für Stanzmaschinen
Gehängeabmessungen(lxbxh):
2000 x 1000 x 1400 mm
Gewicht des Gehänges: max. 2500 kg
Taktzeit: 15 min
Fördergeschwindigkeit: 1,4 - 7 m/min
Durchsatz pro Stunde: 4 Teile
Auf- bzw. Abnahme der Teile:
über ungeführte Hub und Senkstation
Drehung im Lackierbreich: keine Drehung
Einsatzbereich: Temp. max. 100°C

Eingesetztes Fördersystem:
TYP: Caldan POWER + FREE 420
Kettenart: Kardankette
Kettenteilung: 270 mm
Mitnehmerabstand (Power+Free):
1.620 mm

Laufwagenausführung:
Laufwagen: 4-fach Laufwerk
Traversenlänge: 2000 mm
Dreheinrichtung: nicht vorgesehen
Laufwagenpuffermass - längs: 2300 mm

P&F420 im Einsatz

P&F420 im Einsatz



Caldan P&F420 - Power & Free Förderer

P&F420 im Einsatz

Kunde & Produkte

Overhead conveyors

Projekt:
Oberflächenbehandlung - Fahrzeugteile
Austellungsort:
Slovenien
Fördersystem:
P&F400 - Power&Free

RENAULT

P&F400

Case story / Renault

OBERFLÄCHENBEHANDLUNG - FAHRZEUGTEILE:

Angaben zur Projektierung:
Endkunde:
Renault, Revoz
Aufstellungsort:
Slovenien, Novo Mesto

Art der Teile :
Fahrzeugteile
Teileabmessungen (L x W x H):
2500 x 800 x 2365 mm

Teilegewicht, max:
600 kg.
Taktzeit (Prozess und Transport):
3 min.

Fördergeschwindigkeit: 6 m/min.

Auf- bzw. Abnahme der Teile:
manuell via Kransystem

Eingesetztes Fördersystem:
Typ: P&F400 - Power & Free Förderer
Kettentyp: Kardankette
Kettenlänge: 340 m.
Laufwagen: 16-fach Laufwerk

P&F400 im Einsatz

P&F400 im Einsatz

P&F400 im Einsatz

Kunde & Produkte

Overhead conveyors

Projekt:
Oberflächenbehandlung - Teile für Beleuchtung
Austellungsort:
England
Fördersystem:
Kreisförderer

TAMLITE LIGHTING

Kreisförderer

Case story / Tamlite

Oberflächenbehandlung - Beleuchtung :

Angaben zur Projektierung:
Endkunde:
G&G Manufacturing Ltd / Tamlite

Aufstellungsort: GB / Redditch
Art der Teile:
Teile für Beleuchtung

Teileabmessungen (L xB x H):
1,800 x 600 x 300 mm - vertikal
2,400 x 600 x 300 mm - horizontal

Fördergeschwindigkeit: variabel
Kapazität: variabel

Auf- bzw. Abnahme der Teile:
manuell

Eingesetztes Fördersystem:
Typ: Kreisförderer - C•Haken
Kettentyp: S270-90
Kettenteilung: 270 mm
Kettenlänge, total: 45 m.

Kreisförderer - C•Haken im Einsatz

Kreisförderer - C•Haken im Einsatz

Kreisförderer - C•Haken im Einsatz

Kunde & Produkte

Overhead conveyors

Projekt:
Oberflächenbehandlung - Motoren
Austellungsort:
Deutschland
Fördersystem:
P&F400 - Power&Free

DEUTZ®

P&F400

Case story / Deutz

LACKIERANLAGE FÜR MOTOREN:

Angaben zur Projektierung:
Aufstellungsort: Köln, Deutschland
Art der Teile: Motoren
Gehängeabmessungen (lxbxh):
1000 x 1700 x 1500mm

Gewicht des Gehänges: max. 1300 kg
Taktzeit: 5,1 min
Fördergeschwindigkeit:
regelbar max 10 m/min.

Auf- bzw. Abnahme der Teile:
manuell vorgesehen

Drehung: über Laufwerksdrehstation

Eingesetztes Fördersystem:
TYP: Caldan POWER + FREE 400
Kettenart: Kardankette
Kettenteilung: 270 mm
Mitnehmer/Wagenabstand: 1620 mm
Laufwagen:
4-fach Laufwerk, inkl. Lasttraverse

Laufwagenpuffermass: 1750mm
Einsatzbereich: Temp. max. 120°C

P&F400 im Einsatz

P&F400 im Einsatz

P&F400 im Einsatz

P&F400 im Einsatz

Kunde & Produkte

Overhead conveyors

Projekt:
Oberflächenbehandlung - Gussteile
Austellungsort:
Deutschland
Fördersystem:
P&F400 - Power&Free

HEUNISCH GUSS

P&F400

Case story / Heunisch

OBERFLÄCHENBEHANDLUNG VON GUSSTEILE:

Angaben zur Projektierung:
Endkunde: Gießerei Heunisch
Aufstellungsort: Bad Windsheim, Deutschland
Art der Teile: Gussteile
Gewicht des Gehänges: max. 1000 kg
Taktzeit Öfen: 1,125 min
Taktzeit Tauchlinie / Spritzstand:
Tauchen ca. 3 min
Spitzen ca. 4,5 min
Fördergeschwindigkeit: ca. 6 m/min
Auf- bzw. Abnahme der Teile:
manuell, im Stillstand / Stopp-Position
Drehung im Lackierbereich:
manuelles Drehen durch den Werker
Temp. max. 150°C

Eingesetztes Fördersystem:
TYP: Caldan POWER + FREE 400
Kettenart: Kardankette
Kettenteilung: 270 mm
Kettenlänge: 860 m.

Laufwagenausführung:
Laufwagen: 3-fach Laufwerk
Traversenlänge: 2000 mm
Laufwagenpuffermaß:
- längs: 2.200 mm

P&F400 im Einsatz

P&F400 im Einsatz

P&F400 im Einsatz

P&F400 im Einsatz

Kunde & Produkte

Overhead conveyors

Projekt:
Oberflächenbehandlung - Armaturen
Austellungsort:
Deutschland
Fördersystem:
P&F400 - Power&Free

ERHARD ARMATUREN

P&F400

Case story / Erhard

OBERFLÄCHENBEHANDLUNG VON ARMATUREN:

Angaben zur Projektierung:
Endkunde: Erhard Armaturen
Aufstellungsort: Heidenheim, Deutschland
Art der Teile: Gussarmaturen
Teilegewicht: max. 1500 kg
Gehängeabmessungen (lxbxh):
1.650 x 800 x 1650 mm

Gewicht des Gehänges: max. 1.500 kg
Taktzeit: 10 min Pulver
Fördergeschwindigkeit: ca. 4-8 m/min
Auf- bzw. Abnahme der Teile:
manuell, im Stillstand / Stopp-Position
Drehung im Lackierbereich : keine vorgesehen
Einsatzbereich: Temp. max. 250°C

Eingesetztes Fördersystem:
TYP: Caldan P&F 400
Kettenart: Kardankette
Kettenteilung: 270 mm
Mitnehmerabstand (Power+Free):
1.080 mm gesamte Anlage
Laufwagenausführung:
Laufwagen: 4-fach Laufwerk
Traversenlänge: ca. 1.500 mm
Dreheinrichtung: arretierbarer Drehkopf
180°, Mitte Traverse
Laufwagenpuffermaß - längs: 2.000 mm

P&F400 im Einsatz

P&F400 im Einsatz

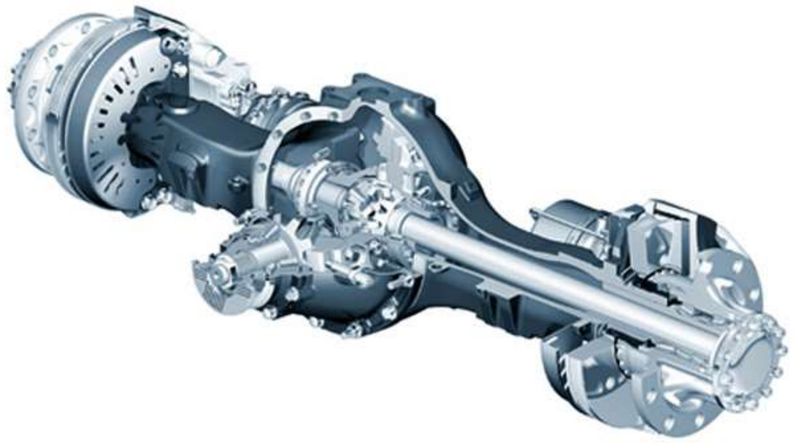
Caldan P&F400 - Power & Free Förderer

Caldan P&F400 - Laufwagen

Kunde & Produkte

Overhead conveyors

Projekt:
Oberflächenbehandlung - LKW Hinterachsen
Austellungsort:
Deutschland
Fördersystem:
P&F400 - Power&Free



DAIMLERCHRYSLER

P&F400

Case story / Daimler Chrysler

OBERFLÄCHENBEHANDLUNG - LKW HINTERACHSEN:

Angaben zur Projektierung:
Endkunde: Daimler-Chrysler, Kassel
Aufstellungsort:
Werk Kassel, Deutschland
Art der Teile: LKW Hinterachsen
Teileabmessungen (lxbxh):
max 2.150 x 800 x 700 mm
Teilegewicht: max. 1.000 kg
Gehängeabmessungen (lxbxh):
2.200 x 800 x 700 mm

Gewicht des Gehänges:
Max. 1.500 kg inkl. Warenträger
Taktzeit: 2 m/min

Fördergeschwindigkeit Außenstrecken:
max. 8 m/min
Fördergeschwindigkeit in Prozeßbereiche:
1,4 m/min
Durchsatz pro Stunde: 30 Teile
Auf- bzw. Abnahme der Teile: manuell

Eingesetztes Fördersystem:
Typ: P&F400 - Power & Free Förderer
Kettenart: Kardankette
Kettenlänge: 610 m.
Laufwagen: 16 rädrig mit Führungsrollen

P&F400 im Einsatz

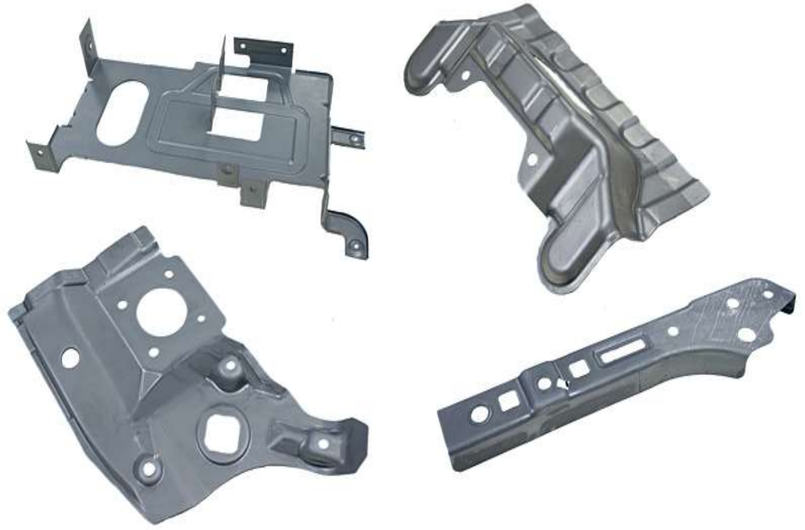
P&F400 im Einsatz

P&F400 im Einsatz

Kunde & Produkte

Overhead conveyors

Projekt:
Oberflächenbehandlung - Stahlteile
Austellungsort:
Schweden
Fördersystem:
P&F400 - Power&Free



JITECH

P&F400

Case story / Jitech

Oberflächenbehandlung - Stahlteile:

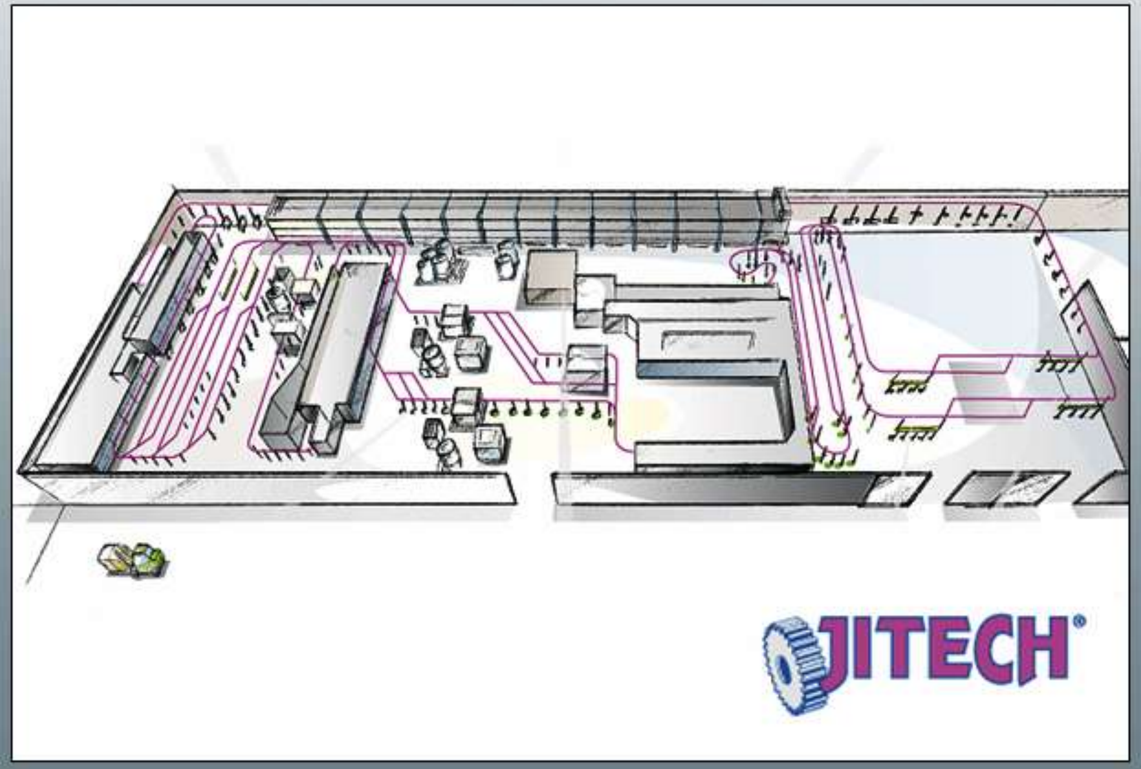
Angaben zur Projektierung:
Endkunde: Jitech AB
Aufstellungsort:
Tingsryd - Schweden
Art der Teile:
diverse Stahlteile

Teileabmessungen (L x B x H):
3000 x 1000 x 2000 mm

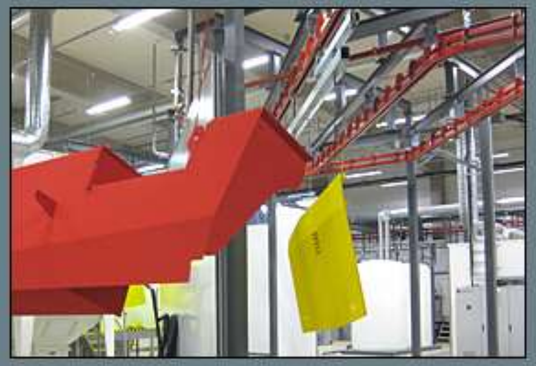
Gewicht der Teile: 500 kg
Taktzeit: ca. 2 min
Fördergeschwindigkeit: 2 m/min.
Kapazität: ca. 30 Teile/Stunde

Auf- bzw. Abnahme der Teile:
manuell

Eingesetztes Fördersystem:
Typ: P&F400 - Power&Free Förderer
Kettentyp: Kardankette
Kettenteilung: 270 mm
Kettenlänge, total: 1.470 m.



Layout - Lackieranlage



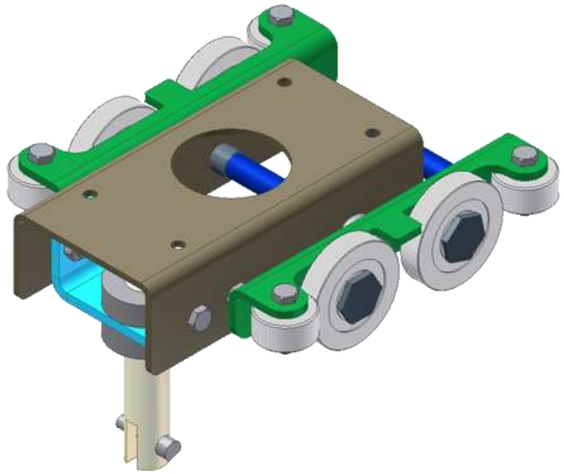
P&F400 im Einsatz

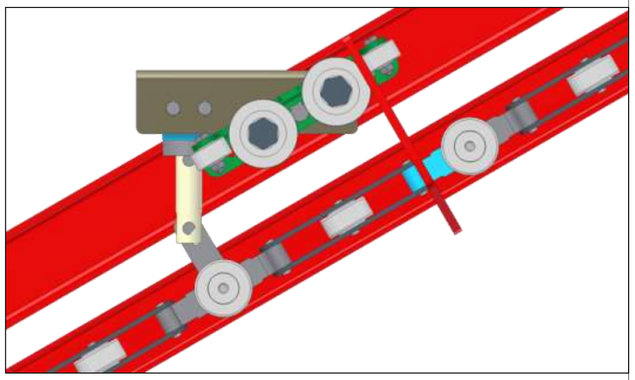
P&F400 im Einsatz

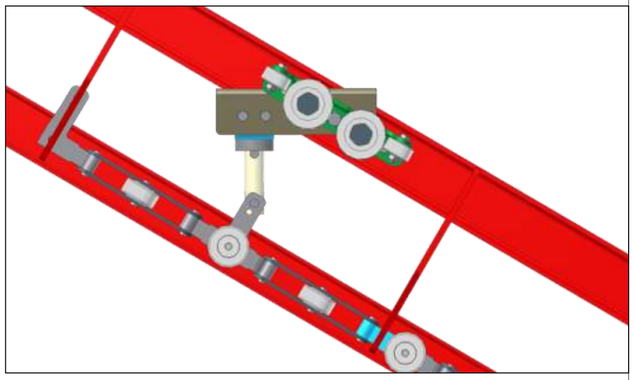
P&F400 im Einsatz

Bodenkreisförderer

HD100S - Stepper
“Alles im Lot”







neu!

HD100S

Vielen Dank für Ihre Aufmerksamkeit.

Für Fragen rund um das Thema Fördertechnik stehen wir Ihnen gerne jederzeit zur Verfügung.
Auch bei Ihnen vor Ort. Bitte sprechen Sie uns an.

CALDAN Conveyor A/S

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MESSER

Industrial application of more component shielding gases for GMAW/GTAW process

APPLICATION OF MORE COMPONENT AR-BASED SHIELDING GASES FOR GMAW/GTAW WELDING IN INDUSTRY

mag. Edvard Bjelajac

MESSER GROUP

1898 FUNDATION OF MESSER COMPANY

>5000 EMPLOYEES

>300 APLICATIONS

>130 SPECIAL SHIELDING GASES

MESSER GROUP – WORLDWIDE


TITANIUM INDUSTRY CO, OF PANGANG CO. LTD.
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SIEMENS
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uralita
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Xiangtan Iron & Steel Co.
OSRAM
ArcelorMittal
EVONIK
INDUSTRIES
REPSOL
Johnson Controls
PSA PEUGEOT CITROËN
bosal
The Coca-Cola Company
Heineken
Clariant
DELPHI
Driving Tomorrow's Technology
Celanese
BASF
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Bayer
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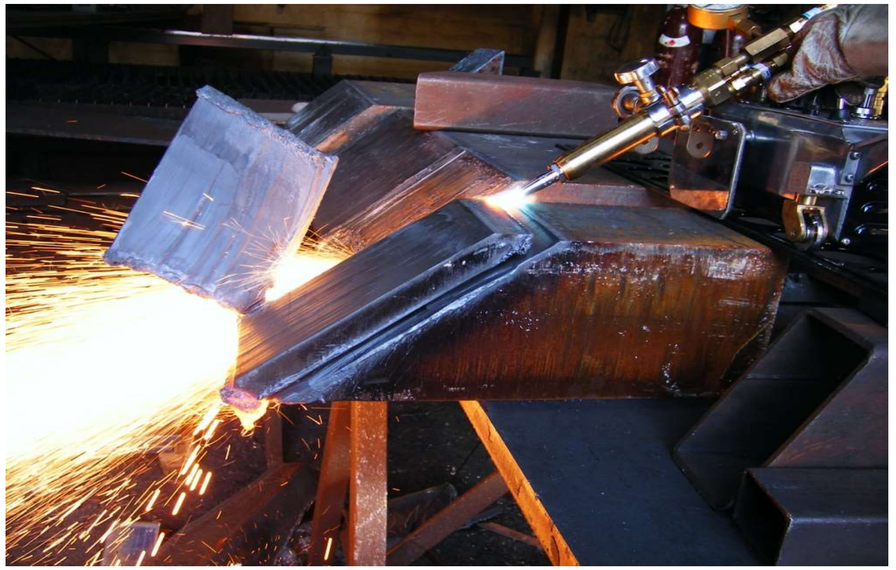
MESSER - SLOVENIA

MESSER GASSES APLICATIONS IN INDUSTRY

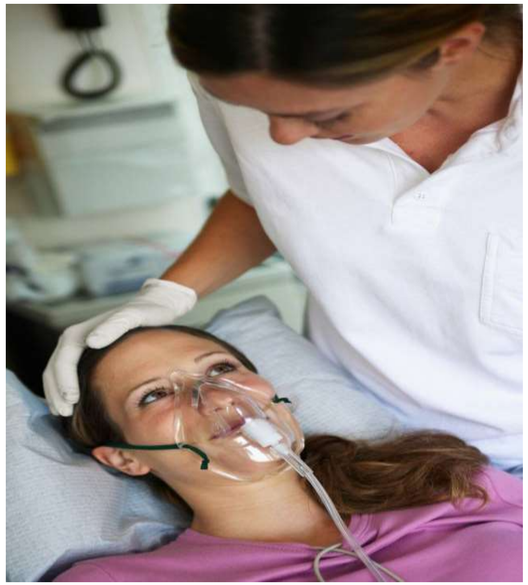
-Food industry

Welding and cutting



MESSER GASSES APLICATIONS IN INDUSTRY

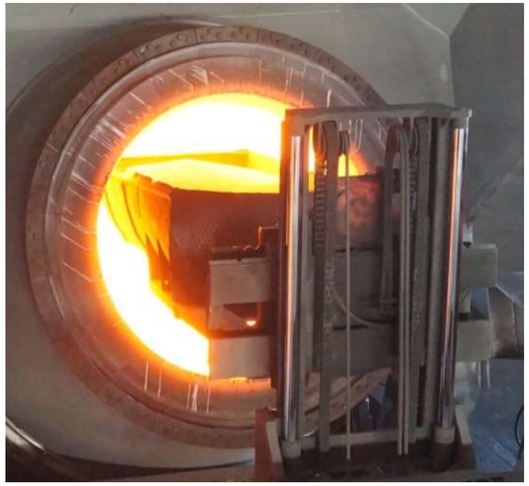
Medical gases



Special gases

MESSER GASSES APLICATIONS IN INDUSTRY

Metalurgy and glas industry



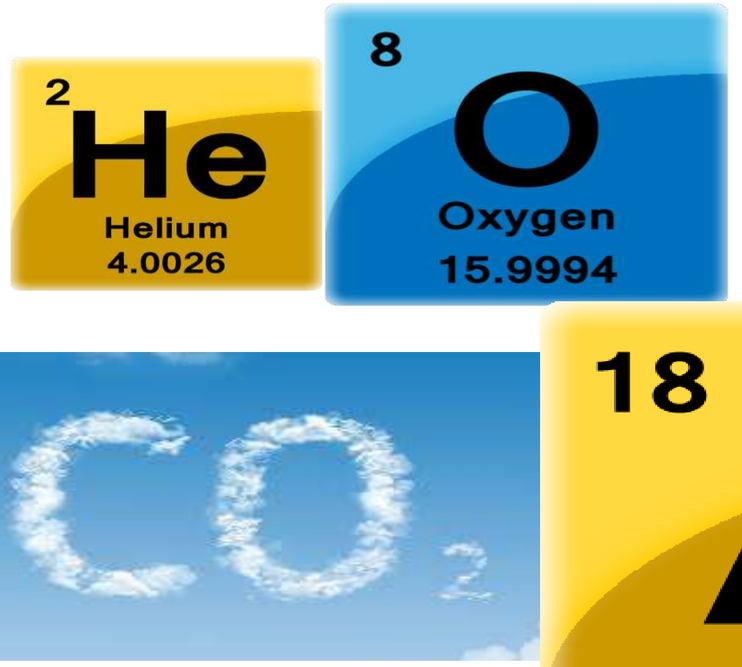
Chemsitry and farmacevtic industry

WELDIND PROCESSES AND SHIELDING GASSES

Main processes for fussion welding in industry:

- MIG/MAG (GMAW)
- MIG/MAG (FCAW)
- TIG (GTAW)

GMAW WELDING AND SHIELDING GASSES



DIN EN ISO 14175

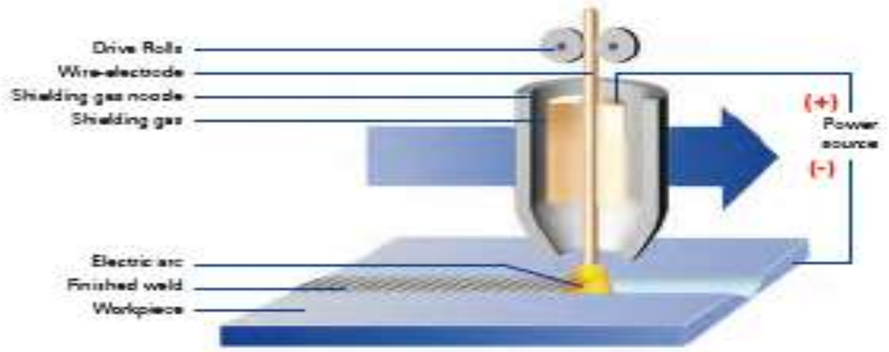
Shielding gases for welding applications

Abbreviation Group	Ident-No.	Components in %, -Vol. oxidizing CO_2	oxidizing O_2	inert Ar	inert He	reducing H_2	less-active N_2
I	1			100			
	2				100		
	3			balance	$0,5 \le He \le 95$		
M1	1	$0,5 \le CO_2 \le 5$		balance[1]		$0,5 \le H_2 \le 5$	
	2	$0,5 \le CO_2 \le 5$		balance[1]			
	3		$0,5 \le O_2 \le 3$	balance[1]			
	4	$0,5 \le CO_2 \le 5$	$0,5 \le O_2 \le 3$	balance[1]			
M2	0	$5 < CO_2 \le 15$		balance[1]			
	1	$15 < CO_2 \le 25$		balance[1]			
	2		$3 < O_2 \le 10$	balance[1]			
	3	$0,5 \le CO_2 \le 5$	$3 < O_2 \le 10$	balance[1]			
	4	$5 < CO_2 \le 15$	$0,5 \le O_2 \le 3$	balance[1]			
	5	$5 < CO_2 \le 15$	$3 < O_2 \le 10$	balance[1]			
	6	$15 < CO_2 \le 25$	$0,5 \le O_2 \le 3$	balance[1]			
	7	$15 < CO_2 \le 25$	$3 < O_2 \le 10$	balance[1]			
M3	1	$25 < CO_2 \le 50$		balance[1]			
	2		$10 < O_2 \le 15$	balance[1]			
	3	$25 < CO_2 \le 50$	$2 < O_2 \le 10$	balance[1]			
	4	$5 < CO_2 \le 25$	$10 < O_2 \le 15$	balance[1]			
	5	$25 < CO_2 \le 50$	$10 < O_2 \le 15$	balance[1]			
C	1	100					
	2	balance	$0,5 \le O_2 \le 30$				

MAG welding

Shielding gases for MAG welding of mild steel

Product	Group ISO 14175	Composite in % - Vol. Ar	CO_2	O_2	He	Applications
Ferroline C8	M 20	92	8	-	-	mild steel
Ferroline C18	M 21	82	18	-	-	mild steel
Ferroline C25	M 21	75	25	-	-	mild steel
Ferroline X4	M 22	96	-	4	-	low/restr. high alloyed steels
Ferroline X8	M 22	92	-	8	-	low/restr. high alloyed steels
Ferroline C6 X1	M 24	93	6	1	-	mild steel
Ferroline C12 X2	M 24	86	12	2	-	mild steel
Ferroline C5 X5	M 23	90	5	5	-	low/restr. high alloyed steels
Ferroline He20 C8	M 20	72	8	-	20	mild steel
Carbon dioxide	C 1	-	100	-	-	mild steel



CASE 2: ROBOTSKO WELDING, LOW ALLOYED STEEL

Base material: **S235 JO, 3-5 mm, plate - tube**

Welding consumables: G3Si1, cooper coated, 1,00 mm

Shielding gas:
Ar+18CO2 FERROLINE C18,
more component mixture

Base material.: S 275 JR, 8mm, Welding consumables: G3Si1, 1,0 mm, Shielding gas: Ferroline C18, 12 l/min

Base material.: S 275 JR, 8mm, Welding consumables: G3Si1, 1,0 mm, Shielding gas: more component mixture, 12 l/min

SHIELDING GASES FOR GTAW/GTAW WELDING HIGH ALLOYED STEELS

Messer oznaka		**Sestava (%)**						
		Ar	He	O_2	CO_2	H_2	N_2	
Varilni argon 4.6		100						
Helij			100					
Alumix Ni		82,98	15			2	0,015	
Inoxmix X2		98		2				
Inoxmix C2		97,5			2,5		1,25	
Inoxmix He15C2		83	15		2			
Inoxmix He30H2C		67,88	30		0,12	2		
Ferromix X4		96		4				
Ferromix C3X1		96		1	3			

CASE 2: ORBITALNO GTAW WELDING, HIGH ALLOYED STEEL, TUBES FOR PHARMACEUTICAL INDUSTRY

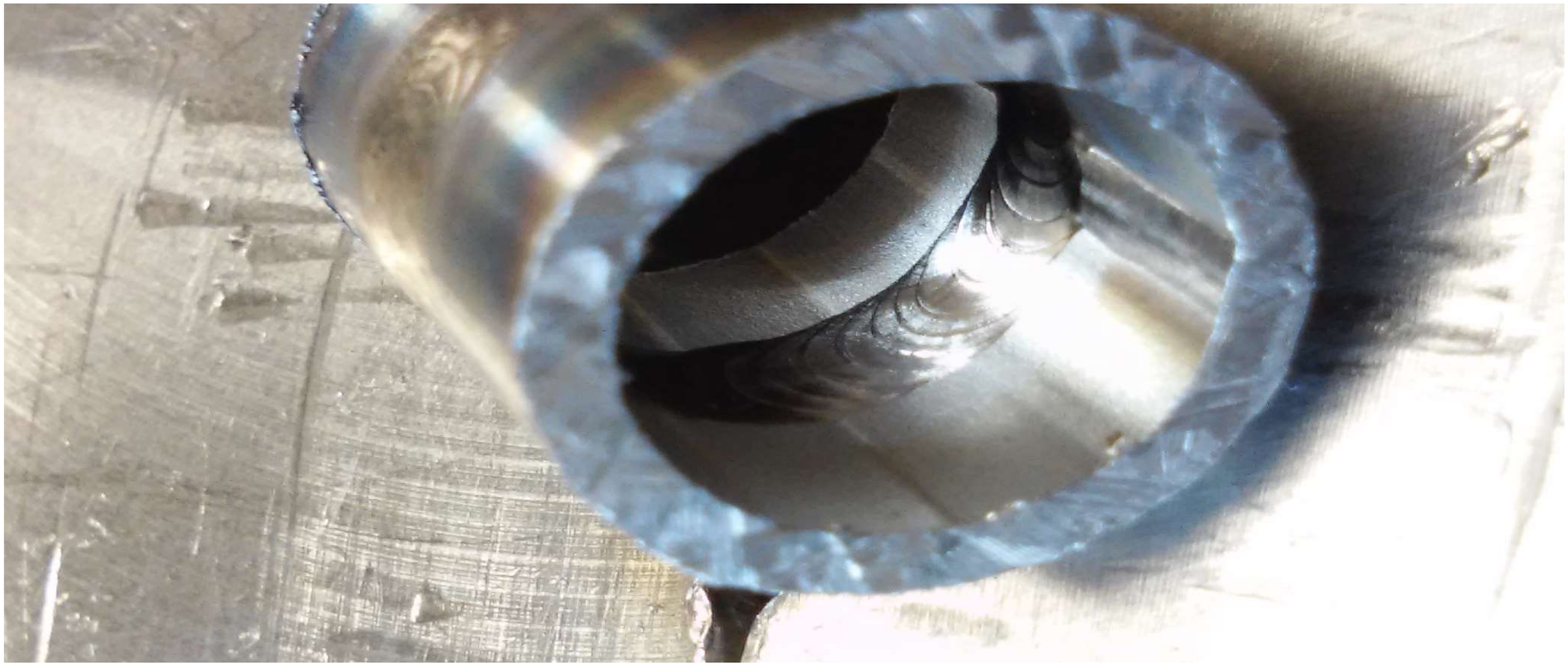
Base material: AISI 316, tube, 2mm wall thickness,

Welding consumables: ---

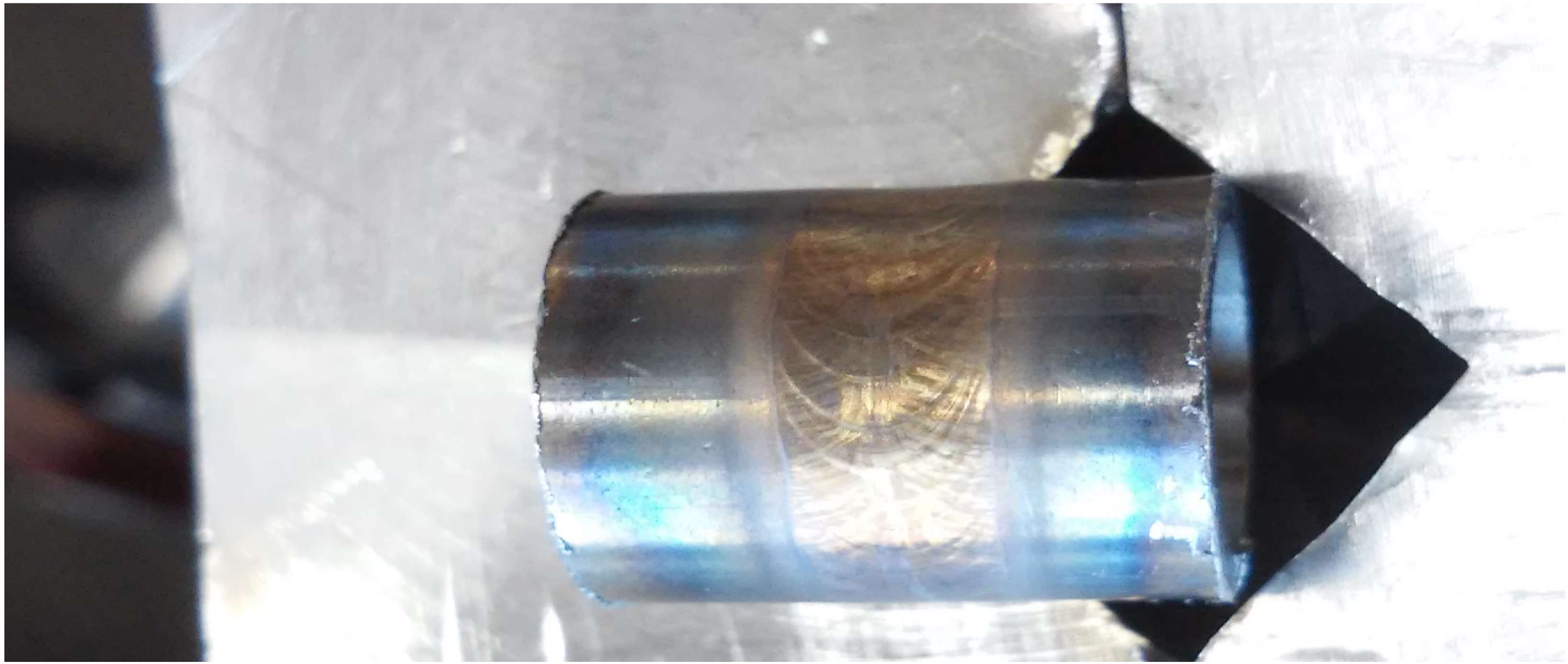
Testing place: production

Base material.: AISI 316 Shielding gas: more component mixture, 8 l/min,

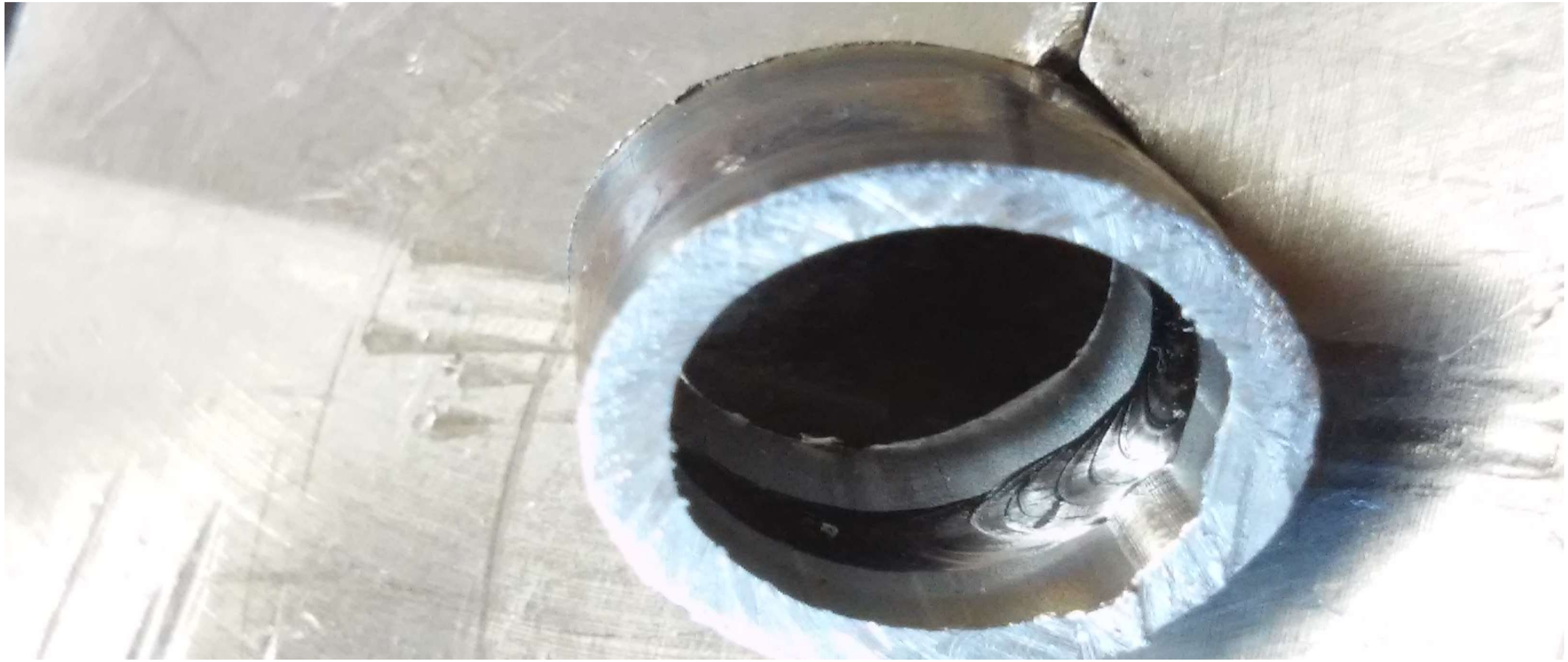
Base material.: AISI 316 Shielding gas: more component mixture, 8 l/min,



Base material.: AISI 316 Shielding gas: more component mixture, 8 l/min,



Base material.: AISI 316 Shielding gas: more component mixture, 8 l/min,



Base material.: AISI 316 Shielding gas: more component mixture, 8 l/min,

CASE 3: MANUAL GTAW WELDING, HIGH ALLOYED STEEL, TUBES FOR PHARMACEUTICAL INDUSTRY

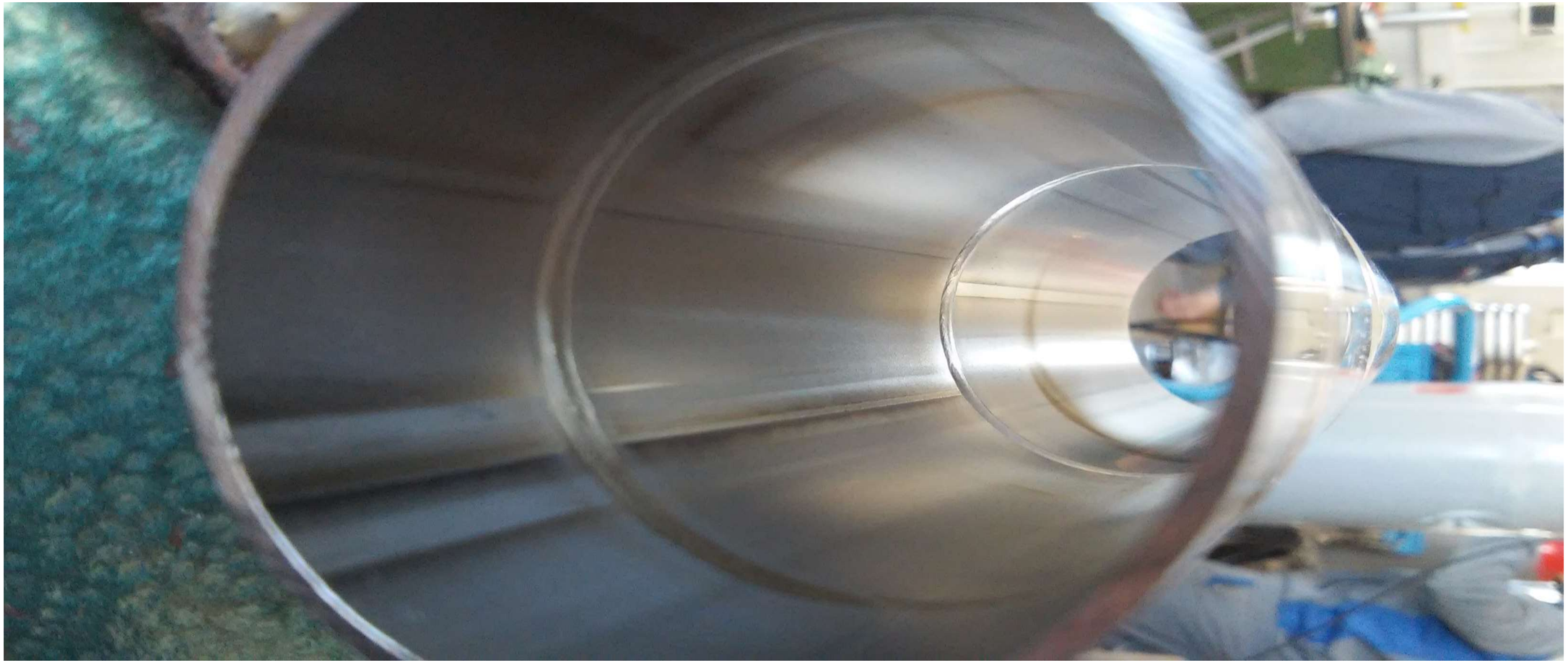
Base material: AISI 316, tube 2mm wall thickness, diameter 50 mm

Welding consumables: ---

Testing place: production

Base material.: AISI 316 Shielding gas: more component mixture, 8 l/min,

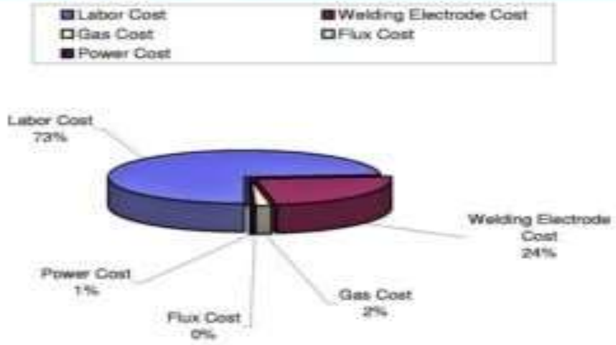
material.: AISI 316 Shielding gas: more component mixture, 8 l/min,



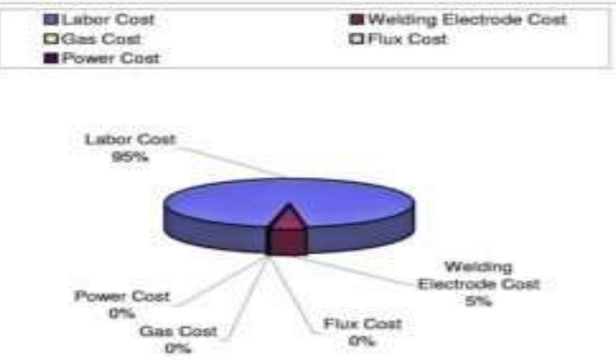
WELDING PROCESS COST CALCULATION

WELDING COST OUTPUT FOR A SINGLE-V GROOVE WELD

OUTPUT FOR FCAW (Gas)		
Amount of filler metal needed	1425.69	lbs
Number of passes per joint ~	5	
Amount of shielding gas	5269.96	ft^3
Number of Gas Bottles Required	16	
Actual welding time	329.37	hr
Deposition Rate	9.20	lb/hr
Labor Cost	$19,762.36	
Welding Electrode Cost	$6,467.66	
Gas Cost	$479.09	
Flux Cost	$ -	
Power Cost	$ 173.91	
Initial Cost	$26,883.02	
Final Cost	$30,915.47	
Total cost per ft of weld	13.44	$/ft
Filler cost per ft of weld	3.23	$/ft
Flux cost per ft of weld	-	$/ft
Gas cost per ft of weld	0.24	$/ft
Labor cost per ft of weld	9.88	$/ft
Shift Productivity	29.43	lb welded /in 8 hr



OUTPUT FOR SMAW (14" Stick)		
Amount of filler metal needed	1896	lbs
Number of passes per joint ~	7	
Amount of shielding gas	0.00	ft^3
Number of Gas Bottles Required	N/A	
Actual welding time	1442.67	hr
Deposition Rate	2.80	lb/hr
Labor Cost	$86,560.00	
Welding Electrode Cost	$4,267.04	
Gas Cost	$-	
Flux Cost	$ -	
Power Cost	$ 259.68	
Initial Cost	$91,086.72	
Final Cost	$104,749.73	
Total cost per ft of weld	45.54	$/ft
Filler cost per ft of weld	2.13	$/ft
Flux cost per ft of weld	-	$/ft
Gas cost per ft of weld	-	$/ft
Labor cost per ft of weld	43.28	$/ft
Shift Productivity	6.72	lb welded in 8 hr



FCAW (Gas) Provides a 70.48% Savings Relative To The SMAW (14" Stick)


Save three times:
2 Work
1 Time
3 Money

THANK YOU AND NICE DAY!

NORDSON

High quality coating solutions for porcelain enamel powder systems

High quality coating solutions for Porcelain Enamel powder systems

Encore PE Application Technology From Nordson

Michael Lazin
Sales Manager

Electrolux

Overview of newest and largest appliance installation in the United States

PORCELAIN ENAMEL

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Electrolux Chooses Memphis for New North American Cooking Products Manufacturing Center

Electrolux

The announcement of this new manufacturing center, which represents an investment of more than $190 million.

Electrolux

They are Manufacturing Drop-in/Slide-in Ranges, Wall Ovens, Specialty Freestanding Ranges, and Cooktops.







Signature Cobalt Blue Interior



PORCELAIN ENAMEL

Nordson

Application & Recovery Equipment

Electrolux

Powder Porcelain

Powder Paint

3 Cavity Booths
3 Ground Coat Booths
1 Cook Top Base Booths

2 Organic Powder Paint Fas
Color Change Booths

Cartridge Booths

Cyclone Booths

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Two Types of Recovery Systems

In order to capture overspray for reuse or disposal, it must first be recovered.

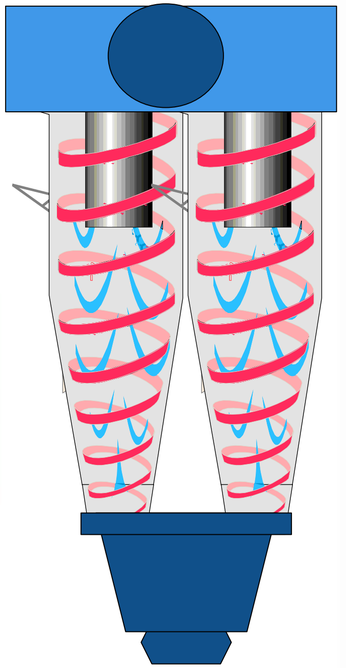
Cartridge

PE or Powder Paint

Powder Booth

Cyclone

Powder Paint



Cartridge Module Systems

- Cartridge Filter Module is attached to the side of the booth.

Cyclone System

- Cyclone used as a **separator** with a cartridge module secondary filter.

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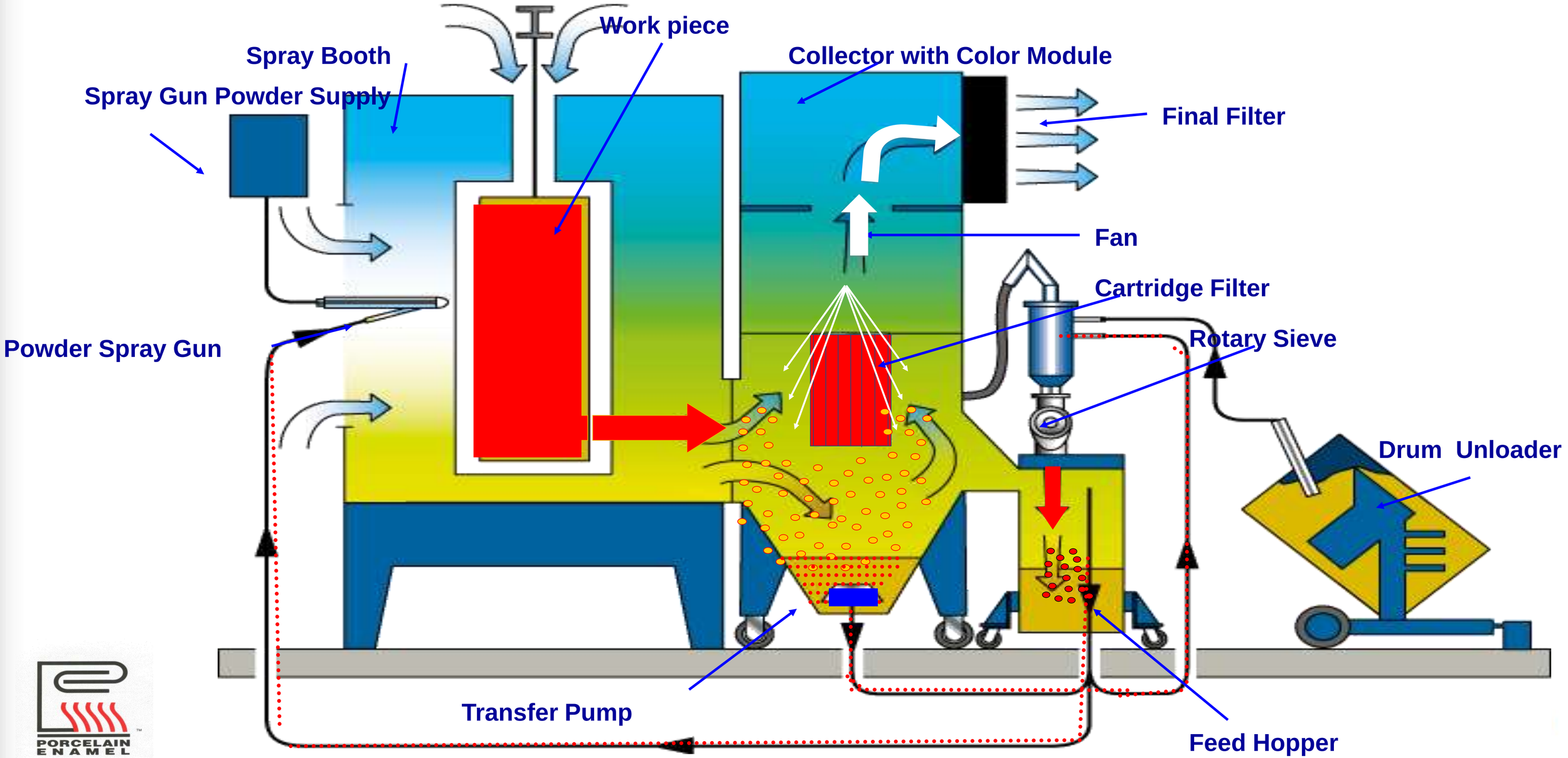
Powder Porcelain Enamel Coating Recovery System Process



Powder Porcelain System

Powder Porcelain Slate (grey), Black and Cobalt Blue

Cook Top Booth – 3 roll-on roll off booths

Cavity Booth – 3 roll-on roll off booths

Ground Coat Booth – 3 roll-on roll off booths

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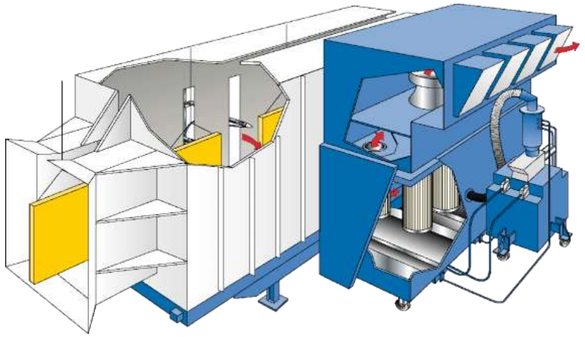
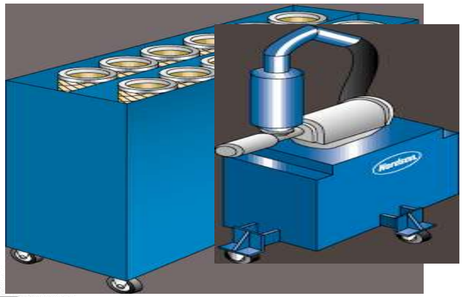
Powder Coating Cartridge System

Cartridge systems use FILTERS to filter powder-laden air and capture 99.9% powder



One filter module for each color.

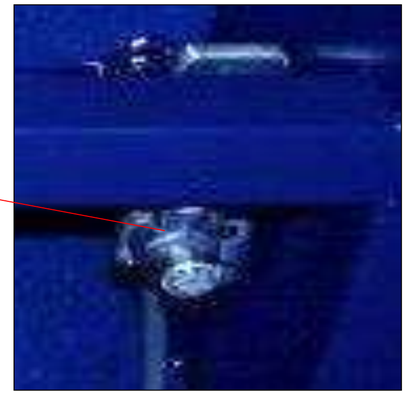


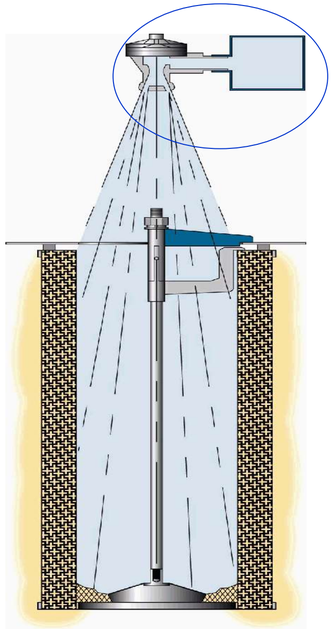
Powder Coating Cartridge System

Dedicated-Color Modules

Primary Filter Filtration

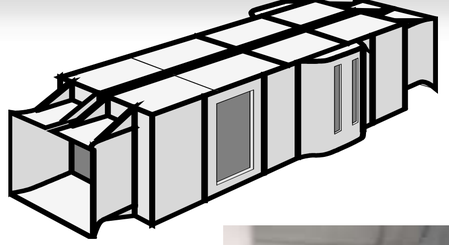
Blow down





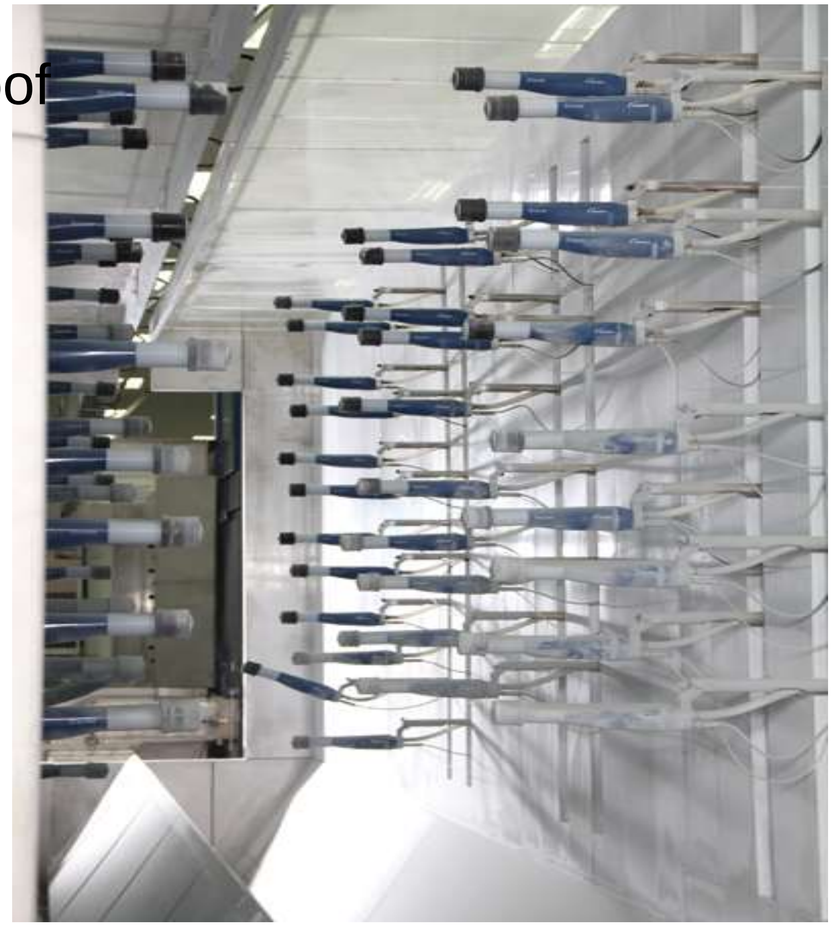
High pressure reverse pulse air keeps filters clean for optimum system efficiency.

PE Booth Canopy



Clear Co-Polymer roof

Poly Plus side panels



PolyPlus canopy construction – sheds powder, highly reflective.

PE Booth Base

Stainless Steel Base

- Automatic booth base blow down
- Timed Intervals
- Reclaim powder gets “used faster”
- Minimizes amount of powder, and time, for clean-up & color change

Perfect Coating Conditions For Powder Porcelain

- **Automatic booth base blow down**

The airflow in the booth is very gentle. These ideal conditions are the key to achieving control of the powder application process, good penetration and regular film thickness, and higher first-pass transfer efficiency.

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Perfect Coating Conditions For Powder Porcelain

(Quiet Zone)

The airflow in the booth is very gentle, ideal for higher efficiency coating with powder porcelain.

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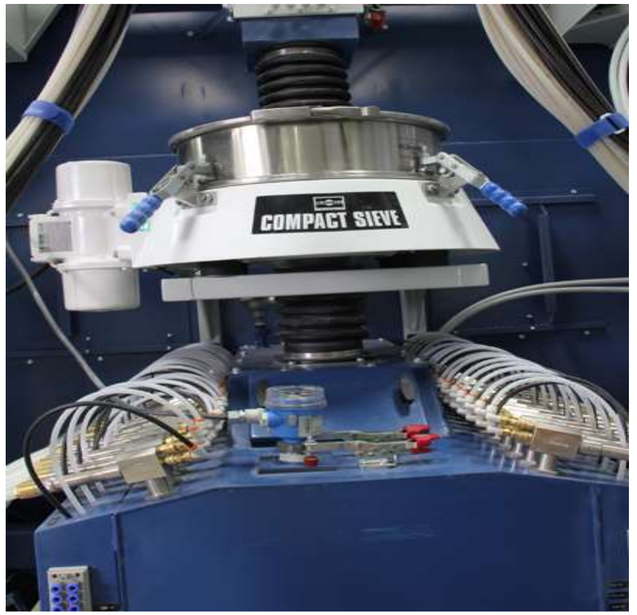
New Encore® High Efficiency PE Pump



112 PE Pumps

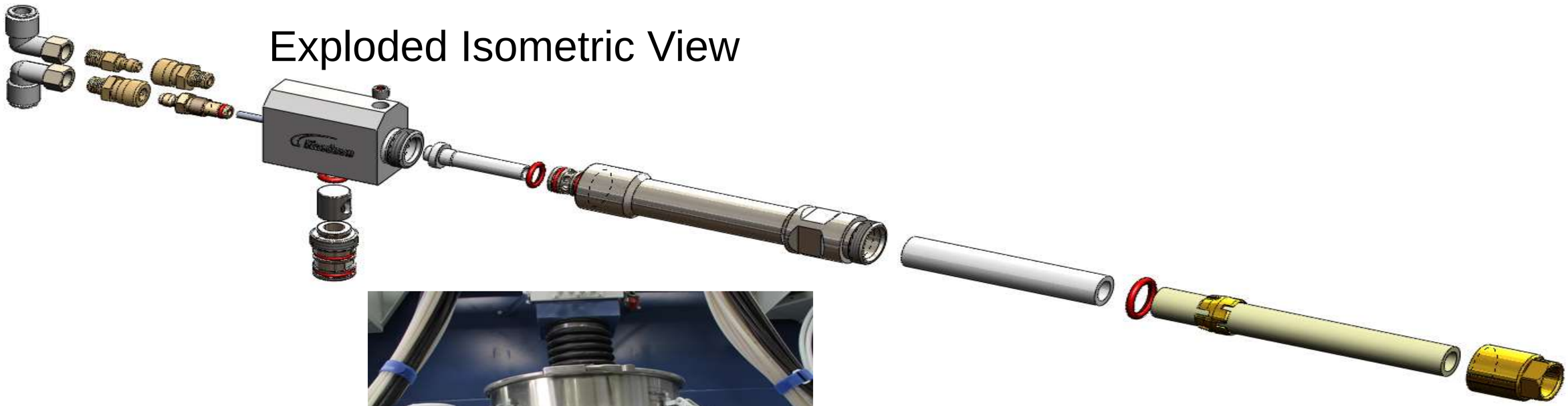
High powder flow / low air velocity PE pump

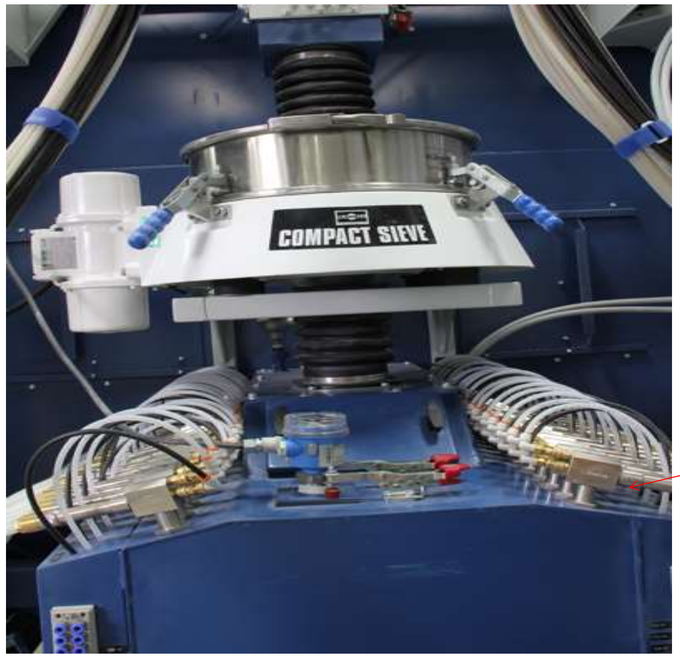
PORCELAIN ENAMEL

Nordson

Encore® PE Pump

Exploded Isometric View





High efficiency PE pumps

Encore® PE Auto Guns

112 PE Guns

Encore® PE Auto & Manual Guns

- **Design and performance improvements**
  - 100 kV voltage multiplier.
  - Electrode air wash.
  - New deflector cap/retainer & locking pattern shaping sleeve.
  - Higher first pass transfer efficiency.

PORCELAIN ENAMEL

Nordson

Encore® PE Auto & Manual Guns

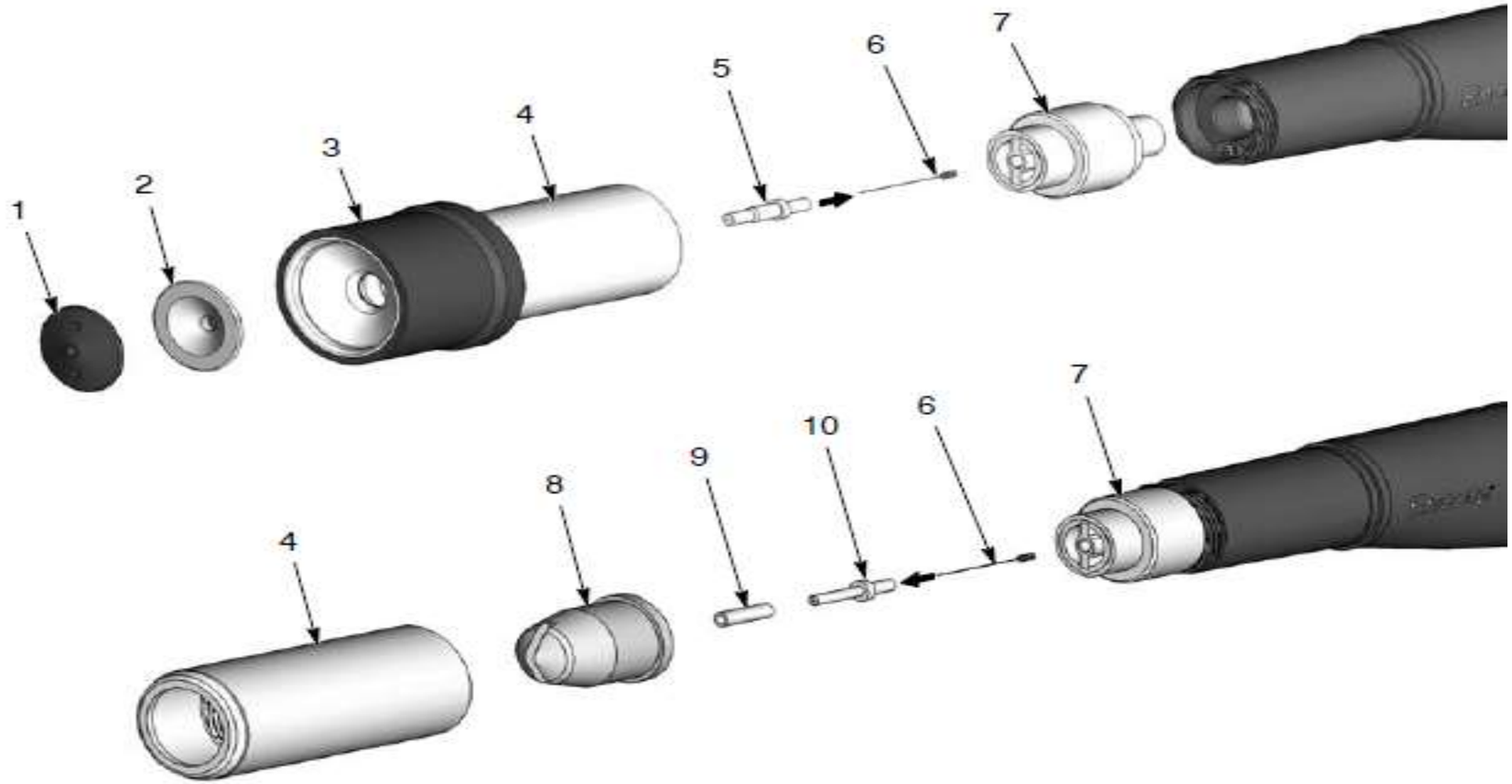


Figure 7 Changing From Conical to Flat or Corner Spray Nozzle

1. Deflector cap
2. Deflector
3. Pattern sleeve
4. Nozzle nut
5. Conical electrode holder
6. Electrode
7. Electrode support
8. Flat spray nozzle
9. Wear sleeve
10. Flat electrode holder

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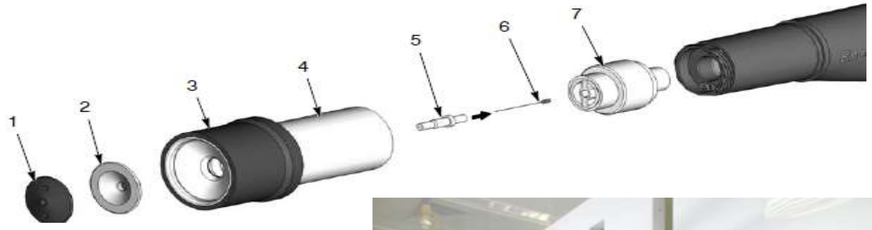
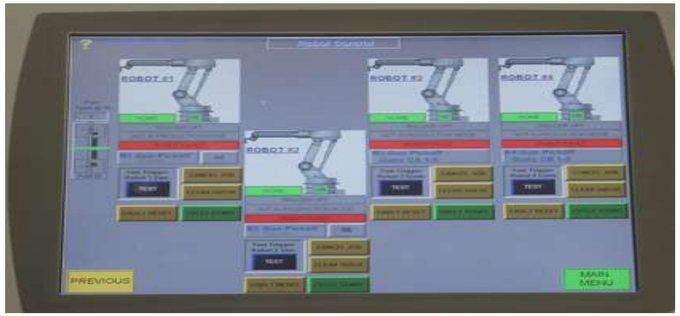
Encore® PE Auto & Manual Guns



Improved pattern adjuster design:

- Pattern adjuster retained in position with set screw, for consistent placement and spray pattern control.

System Controls



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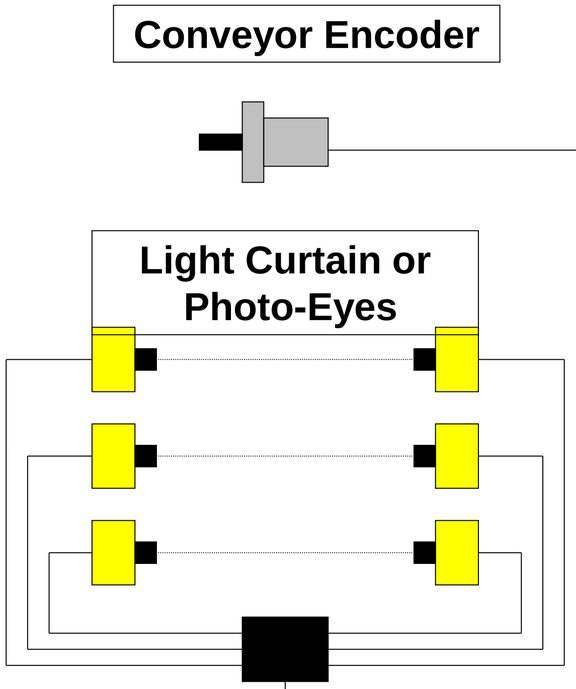
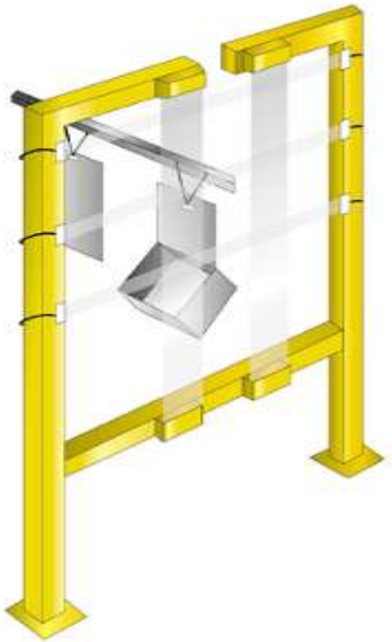
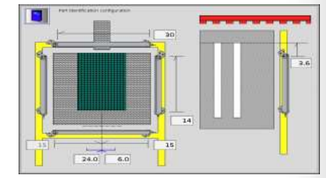
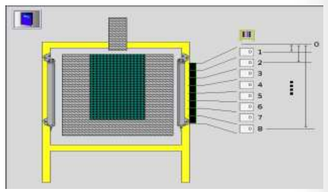
Part Identification



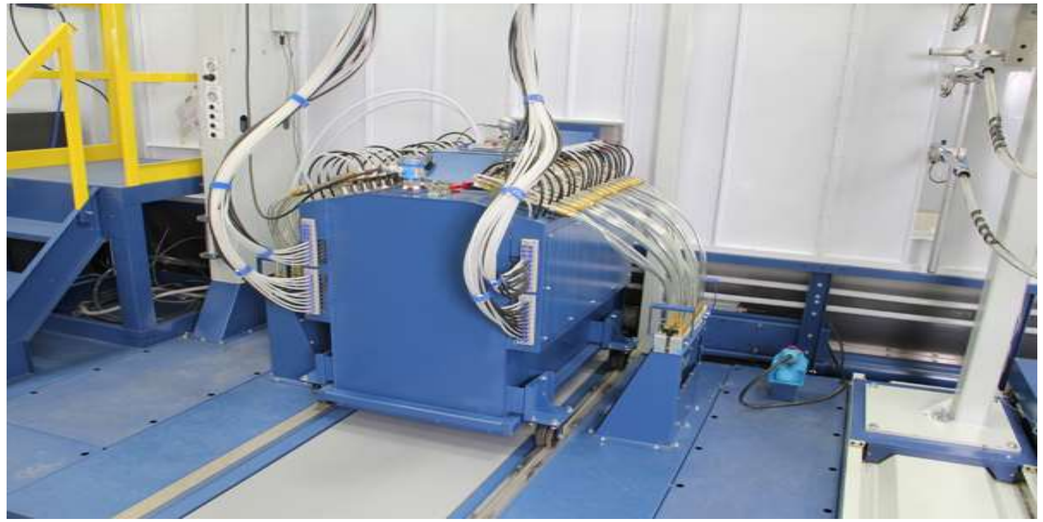


System controller





Feed Hopper



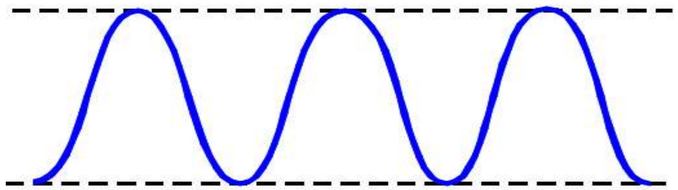
Fixed Guns

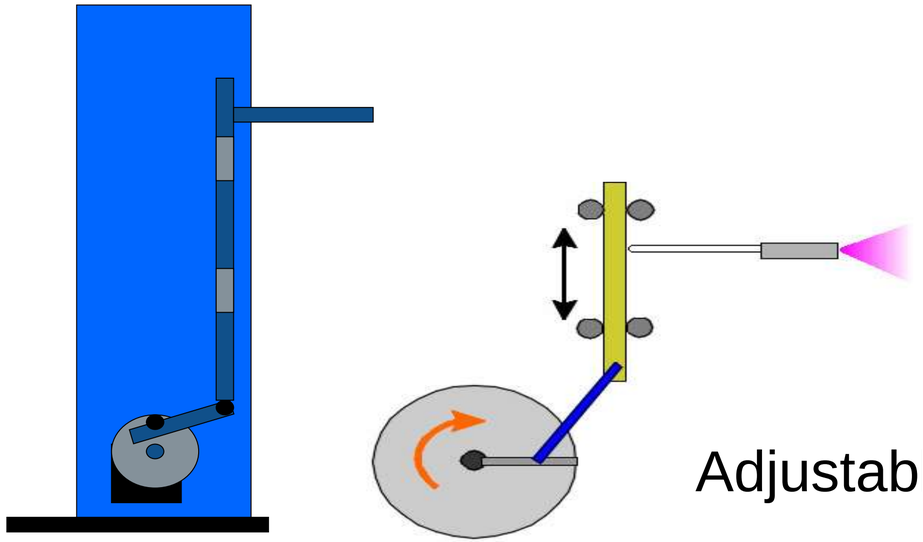
Six fixed gun stands with in-out posi
bases.

When the number of guns and spray patterns can coat a part from a fixed position, it reduces the number of variables in the coating process.

Oscillators

Oscillator uses rotational-to-linear movement transfer and the stroke speed.





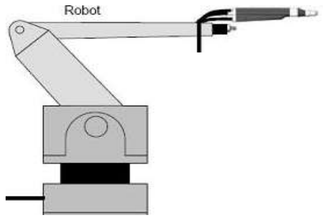
Cook Top Booths & Ground Coat Booths

8 vertical oscillators with in-out positioning bases

Adjustable speed with sheave or drive.

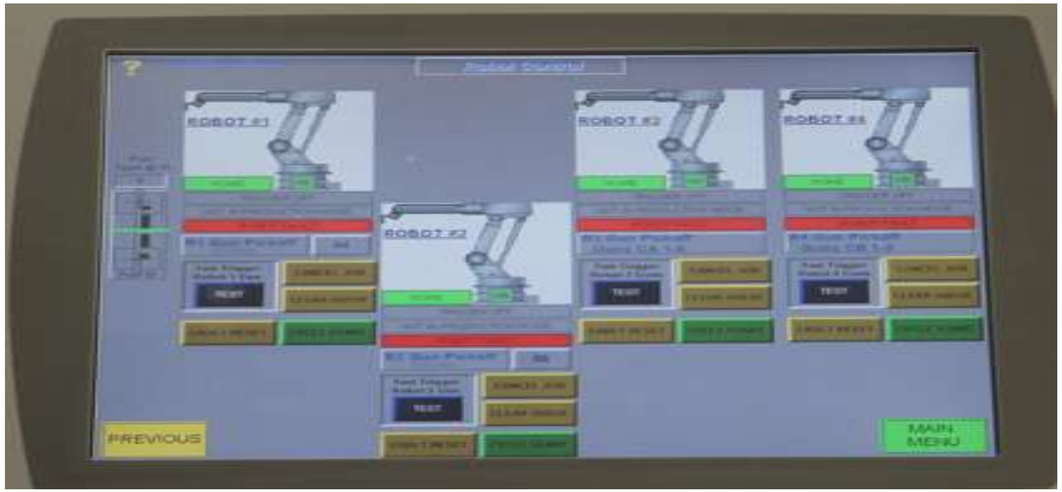
Flywheel design limits stroke adjustments (6"-24") average.

Robots



Powder porcelain cavity for Electrolux – Slate (grey), Black and Cobalt Blue

2 Fanuc M50 Robots with (1) Encore HD Gun each
2 Fanuc M70 robots with (8) Encore PE guns each



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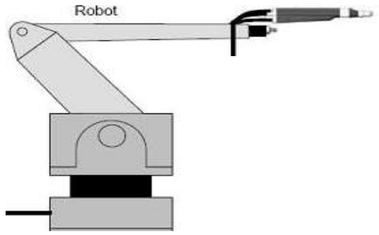
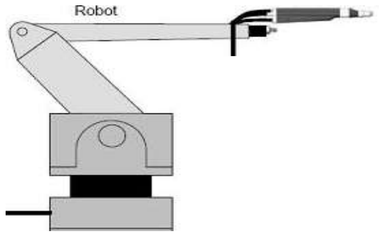
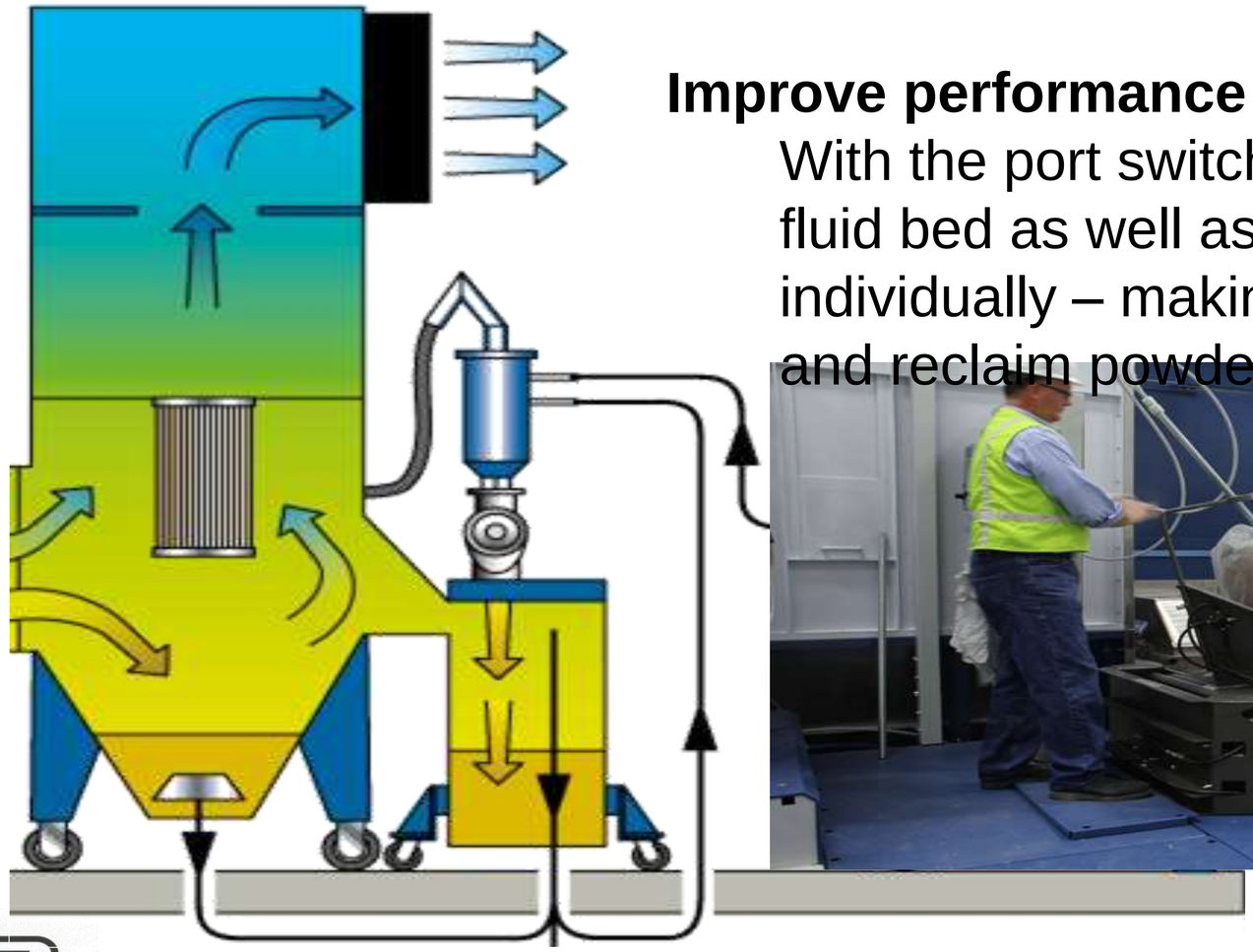
Robots



Robots



Recycle System



Improve performance

With the port switching manifold, cycle times for each fluid bed as well as HDLV virgin can be adjusted individually – making it easier to manage the virgin and reclaim powder mix.

Tilt Table For Virgin Powder

3 HDVL reclaim pumps

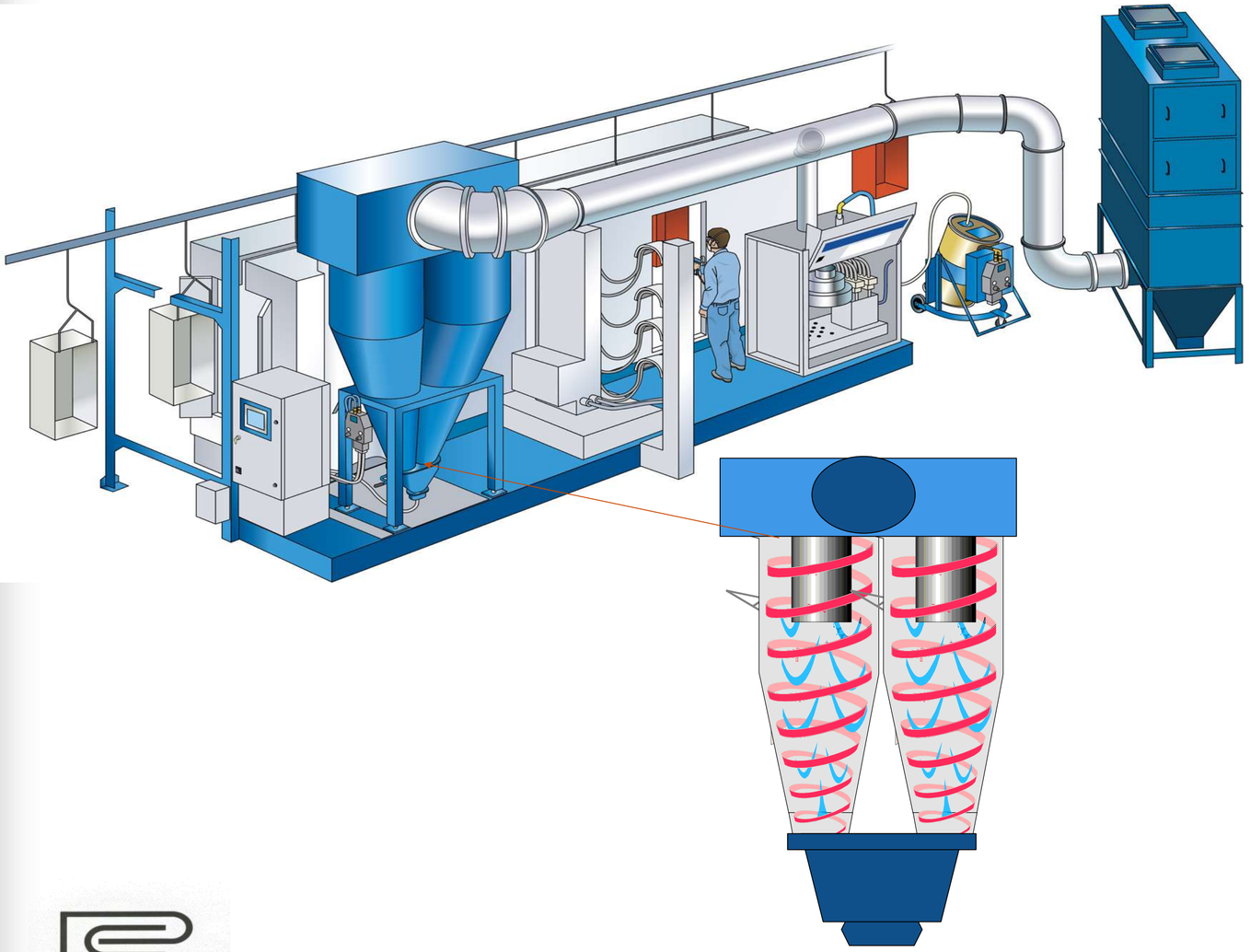
2 HDLV virgin bulk unload pumps

1500 pound tilt table for tote unloading

Powder Paint System

Organic Booth – 2 roll-on roll off booths- all one the same conveyor.

Fast Color Change Booths Powder Paint System



High-Efficiency Twin Cyclone

Organic Cyclone Booth

ColorMax 2 Booth

Booth Cleaning

- Booth doors at entrance and manual gun openings

Low-profile, walk-in booth base

Close-Off Doors

- Aids in maintaining powder in the booth
- Increases airflow for faster, more efficient cleaning

PORCELAIN ENAMEL

Nordson

Feed Center

Feed Center with internal gun purge and 14” sieve.

32 Encore high efficiency powder guns.

Fast Color Change Booth

After Filter

15 Minute color change

Booth moves off-line to change colors.

Thank You !

Michael Lazin

CINKARNA

Trends and innovations in powder coatings

TRENDS AND INNOVATIONS IN POWDER COATINGS

Cinkarna Celje d.d.

Cinkarna Celje d.d.

- Established in 1873.
- A joint stock company employing over 1,000 people.
- One of the largest chemical-processing companies in Slovenia.
- Generating more than 150 million euros in sales revenues per annum.
- Production of powder coatings ca. 2,000 t / year.

Market situation

- Growth at the beginning of the economic crisis stopped.
- Decreasing margins, strong competition and price reductions, lead to decreased investing in development.
- Year 2013: Growth slowly returning. Between years 2012 and 2018, annual growth should be around 6%.

Market situation

- Powder coating market size was 2.25 million tons in 2015, as per the latest research report by Global Market Insights, Inc. Consumer goods and automotives are the leading revenue-generating applications in the powder coating industry[1].

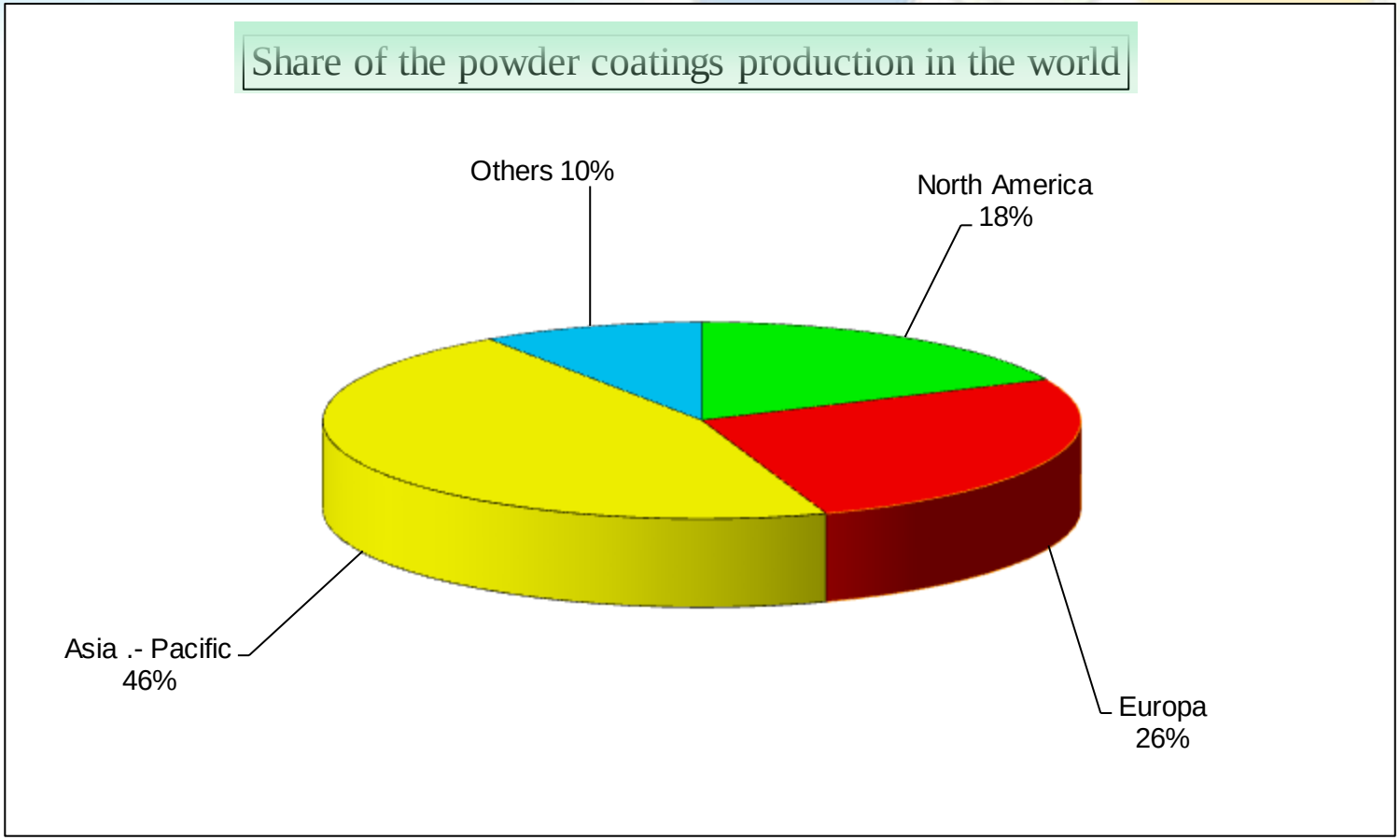
- Before the year 2023, the quantity should reach 3.82 million tons.

- Powder coating market size is set to register USD 15.58 billion by 2023. Favourable sales potential from domestic appliances including microwave ovens, freezer cabinets and washing machines should instigate growth[2].

[1] Source: https://www.gminsights.com/pressrelease/powder-coating-market

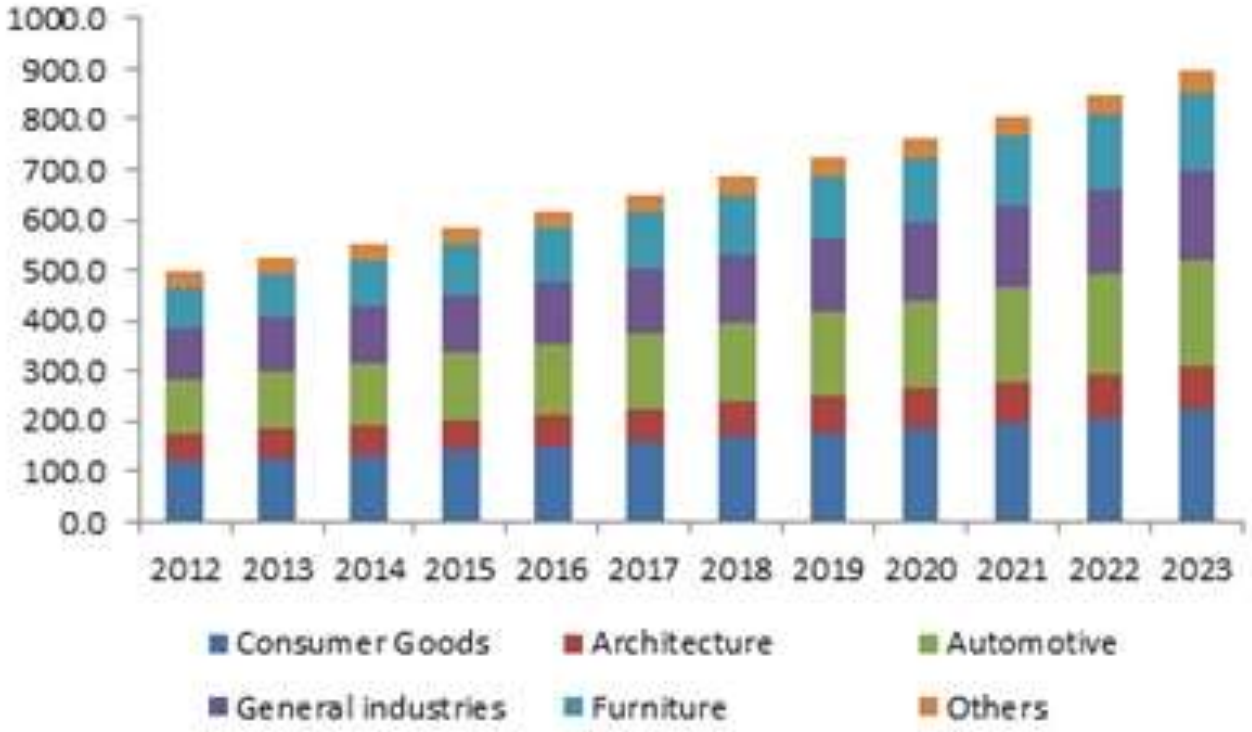
[2] Source: https://www.gminsights.com/industry-analysis/powder-coating-market

Market situation



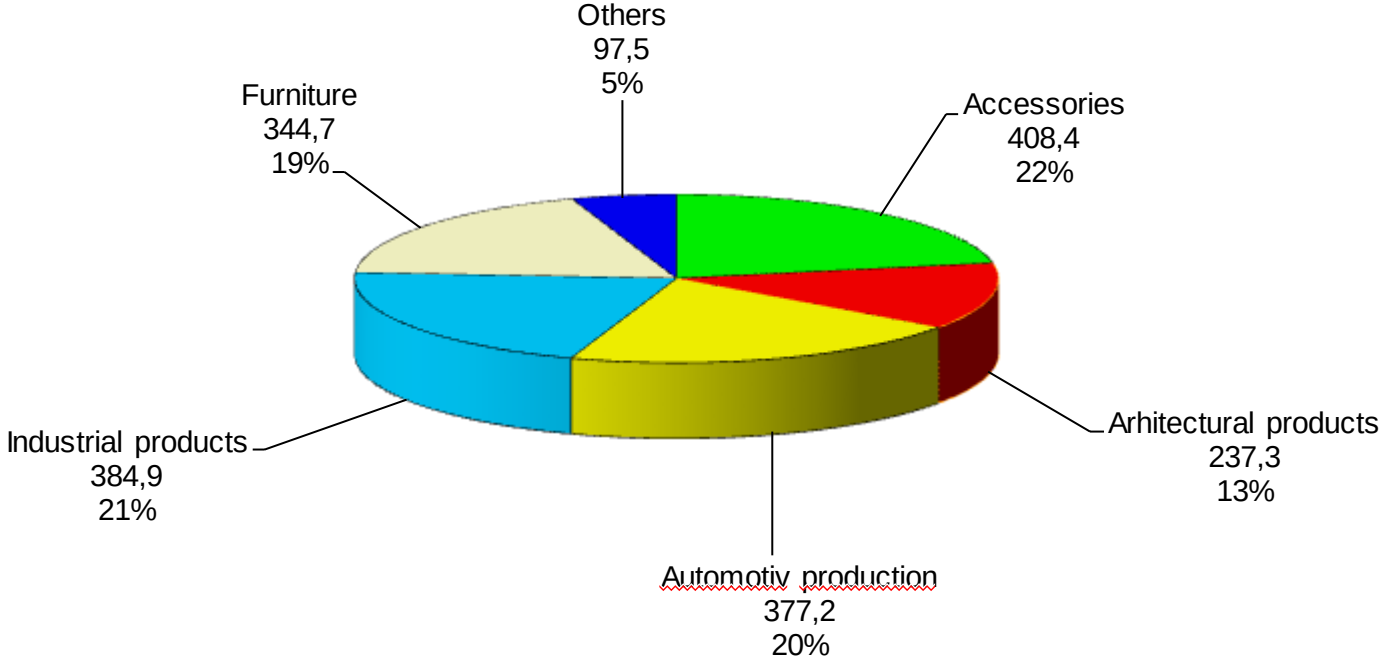
Market situation

Europe powder coatings market size, by application, (Kilotons), 2012-2023



[3] Source: https://www.gminsights.com/industry-analysis/powder-coating-market

Market situation



Growth generators

- Growth generators in the next decade:

  - Renewed economic growth.
  - Further reduction of emissions.
  - Curing temperature reduction – painting more temperature sensitive materials.
  - Developement of more resistant powder coatings for the external influences.
  - Development based on new (nano) technologies and thin layers.
  - Developing new paints for complex products and new application methods.

New technologies and trends

- Low-temperature powder coatings:

  - Polyester/HAA (Primid): polymerisation to the temperature of 160 °C, for an extended period of time (30 min) up to 140 °C.
  - Polyester for UV curing: down to the temperature 110 °C.
  - Epoxy-polyester: down to the temperature 130 °C.
  - Epoxy: to the temperature 120 °C.
  - Classic curing in combination with IR radiation and low-temperature powder coatings opens up the possibility of powder coating of massive metal pieces.

  - EKOLAK: present production of E/P quality 160 °C / 15 min, in development 160 °C / 10 min.

New technologies and trends

- Low-temperature powder coatings – restrictions:

  - Spillage is comparatively worse.
  - More sensitivity in the case of failure to achieve the temperature.
  - Mechanical properties and resistance to solvents / chemicals do not reach the level of conventional powder coatings.
  - Painting and baking MDF and thermoplastic material is significantly more difficult (moisture, conductivity and adhesion of dust, preheat, temperature shrinkage and dimensional stability) and requires special equipment and expertise.

New technologies and trends

- Thin film powder coatings:

  - Thin films, 25-75 μm, can be applied in a wide range of colours, glosses, and textures and ultra thin film (20 - 30 μm) powders are currently being developed. These powders offer better penetration into recesses, more film thickness control, and more effective first pass transfer efficiency.
  - Thinner films, 10-20 μm and smooth.
  - Low temperature cure and heat sensitive substrates have our attention in the next years. Thermoplastic – and flame retardant powder coatings will grow in market share too. Low film weights powder coatings around 25-30 μm thicknesses will become more important.

  - EKOLAK: we are manufacturing powder coatings from coverage level 40 μm further (it depends on the shade).

New technologies and trends

- Powder coating with increased weather resistance

  - In comparison with conventional powder coatings:

    - Qualicoat Class 1: 2 times longer exposure (1 year 'Florida' weather exposure – standard, at least 50% gloss left),

    - Qualicoat Class 2: 7 times longer exposure (3 year 'Florida' – weather exposure, at least 75% gloss left after 1 year),

    - Qualicoat Class 3: 10 times longer exposure to weather conditions (10 year 'Florida' – weather exposure, at least 90% gloss left after 1 year)[4].

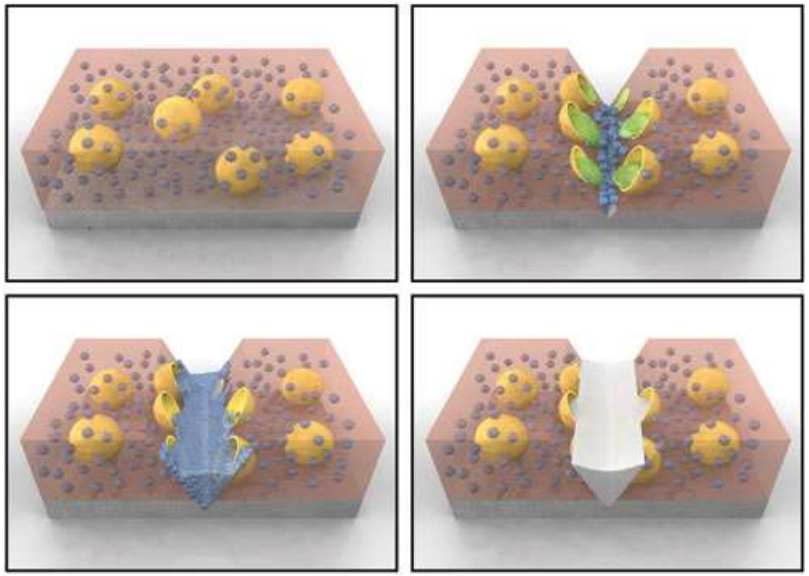
[4] Source: http://www.qualicoatuki.org/assets/02_specification.pdf

New technologies and trends

- They are based on existing binders (polyester, PUR, Acrylic) with certain improvements or. new types of binders (polyvinylidene difluoride - PVDF).
- They have very good to excellent characteristics in terms of external stability, but some inferior mechanical properties.
- PVDF has, in comparison to polyesters, excellent resistance and mechanical properties, free of hardness and a resistance to rubbing.
- Consider the restrictions of appropriate shades, because of some of the more intense and nuance effects, there are not enough resistant pigments.
- EKOLAK: we acquired Qualicoat Class 1 certificate.

New technologies and trends

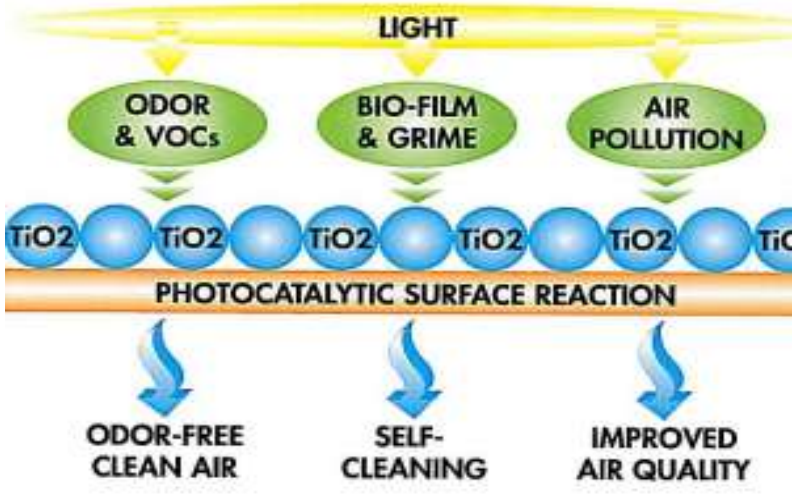
- “Smart coatings” – response to environment changes:
  - Colour shade changes with the temperature or pressure,
  - "Self Repair" – coating fills minor injuries. The technology is based on microencapsulation. Active substance is released to the damaged area and floods caused injury.



New technologies and trends

- “Smart coatings” – response to environment changes:

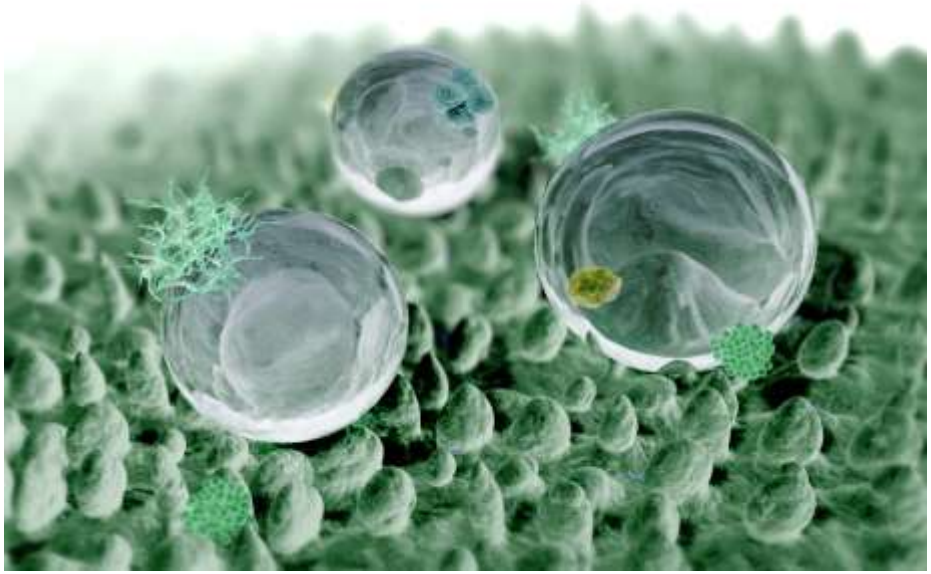
  - “Self-cleaning” – photocatalytic effect, which degrades the impurities on the surface by means of UV and active substances in the paint. The possibility of the purification of pollutants in the air is possible (NOx, hydrocarbons etc.).



New technologies and trends

- “Smart coatings” – response to environment changes:

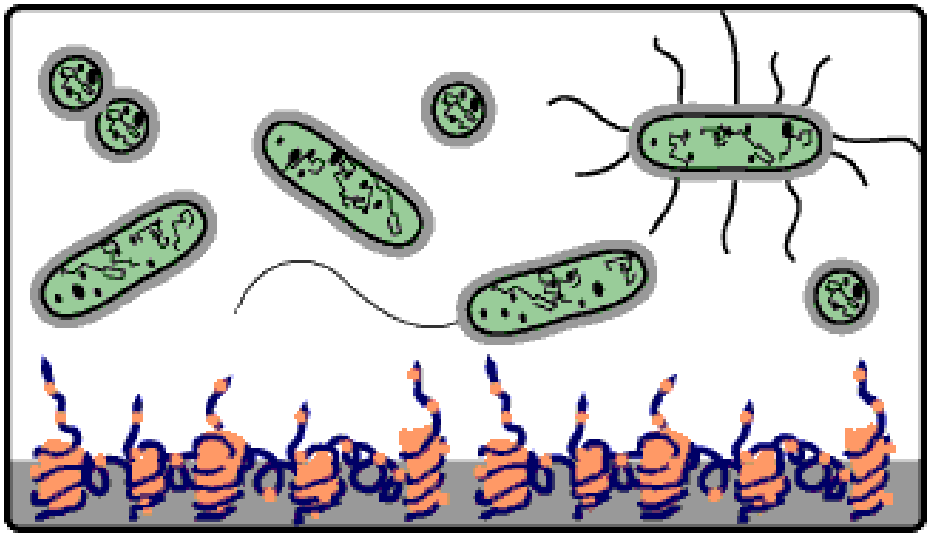
  - Lotus effect - super hydrophobic surface layer which prevents wetting by water droplets and other polar pollutants. It is used alone (anti-grafitti) or in combination with a "self-cleaning".



New technologies and trends

- “Smart coatings” – response to environment changes:

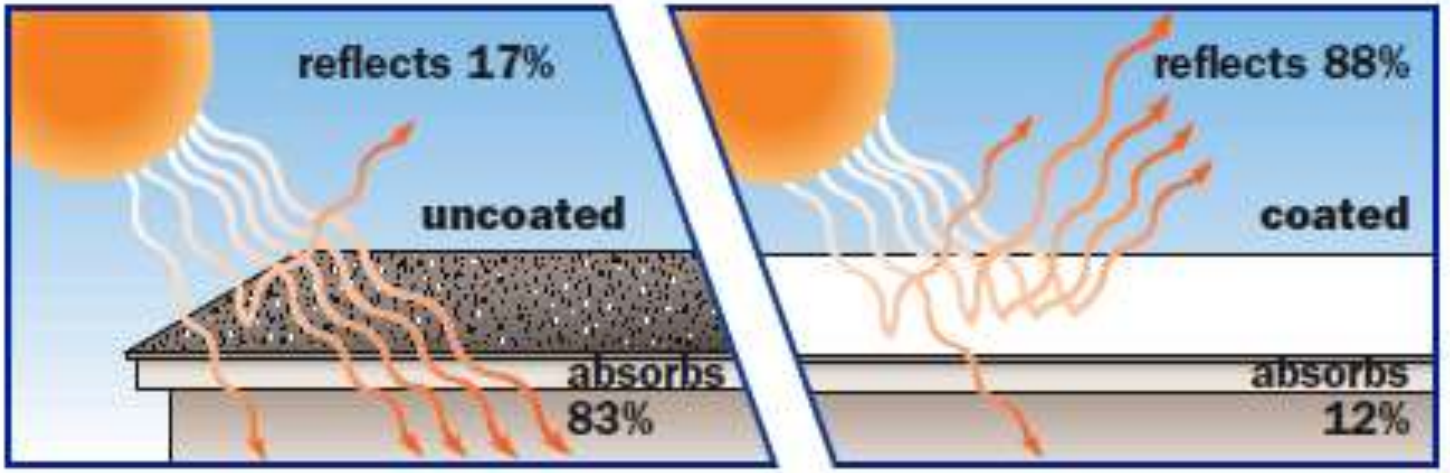
  - Antimicrobial coating - on the surface of the coating layer there is active antimicrobial substance (metal ions, organic substances etc.), which prevents the spreading of microorganisms.



New technologies and trends

- “Cool roof” powder coatings:

  - Powerful IR reflex pigments are used. Consequently, the surface is heated substantially less (about 30 °C). Useful for roofs, window frames, doors, and in the automotive industry.



New technologies and trends

- Thermochromic powder coatings:

  - For these new products innovative chromophores are employed, which become colourless with increasing temperature, thus revealing what has been previously sublimated in the background. These products bring about an added value for objects that could show an optical change connected to a temperature variation; they can lead to a new usage and to the development of new functionalities for every kind of powder-coated object.
  - Thermochromic powders switch from coloured to transparent with a striking effect. These transitions are reversible: the colour of the powder-coat starts to fade-out as the transition temperature is reached, becoming then totally transparent; the surface regains immediately its original colour as soon as it cools down, below the temperature of transition.

New technologies and trends

- Sublimation:
  - Sublimation powder coating is also called Heat Transfer Powder Coating, because of the process of heat transfer printing. This process is a sublimation process, which is a physical-chemical transition of a pattern from transfer paper or film, to a substrate, which is pre-coated with a special powder designed to be the base colour of this sublimation.[5]
  - Through this sublimation process countless effects and patterns such as woodgrain, marble, granite, fancies, pictures can be transferred on substrate surfaces.
  - EKOLAK: We have developed PE/P quality of powder coatings for sublimation, used for windows and doors.

[5] Source: http://www.chinapowdercoating.com/products/heat-transfer-powder-coating)

New technologies and trends

- Powder on Plastic

- Powder coating can be used to coat many types of materials. The most common material is metal, but you can also powder coat wood, plastic, composites, glass, and MDF.
- One solution to powder coating plastic items, is pre-heating. You can heat up the object in the oven, remove the object and powder coat it before it cools. When the powder hits the heated part, it will slightly melt on contact, causing it to stick. After coating the entire part like this, you then place the part back in the oven and cure it like normal.[6]
- Some conventional powder technology is suitable for high temperature plastics. The only requirement is to make the plastic surface conductive and achieving adhesion. These requirements are rather easily accomplished.

[6] Source: http://www.powdercoatguide.com/2012/12/objects-you-can-powder-coat.html#.V7VttPmLS00)

- Expectations:
  - Expected moderate but stable growth.
  - Expanding on some areas that are currently controlled by conventional varnishes.
  - Intensive development of nano-based technologies and new polymers.

Thank you for your attention!

VET

Environmental protection and energy optimization in enamelling industry

VET GmbH Vitreous Enamel Technique

Since 1999 with ample experience in enamelling technology

Foundation: 1999

Employees (2016): 18

ENAMEL CONGRESS PORTOROŽ 19 - 23.09.2016

VET - GmbH Vitreous Enamel Technique

ENAMEL-CONGRESS
PORTOROŽ
19 - 23.09.2016

OPTIMIZATION OF ENERGY CONSUMPTION
+
ENVIRONMENTAL TECHNOLOGY IN ENAMEL INDUSTRY

ENAMEL PREPARATION

PRETREATMENT EQUIPMENT

ENAMEL COATING

ENAMELING FURNACES

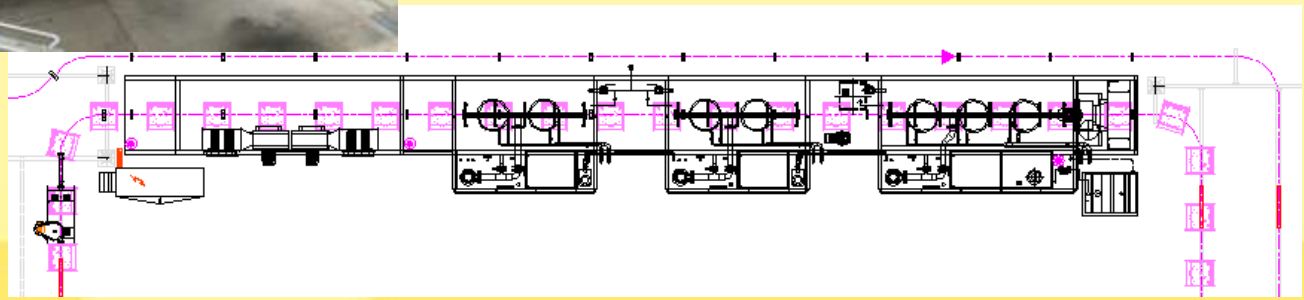
ENAMEL PREPARATION

RTU (**R**eady **t**o **u**se)

- Simple preparation of enamel (mixing of prepared enamel powder with water)
- Shorter preparation time
- Compact design (space requirements)
- Lower investment at initial purchase
- Guaranteed quality of enamel
- Less waste enamel / less energy

PRETREATMENT EQUIPMENT

- Flatware
- Cavities
- Panels
- Boiler



- Small compact plants with three active areas, blowing area with short warm-air dryer
- Dual systems for high production capacity
- Heating with natural gas or with hotwater by using recuperators / heat exchangers
- Saving of required space and energy / less wastewater

ENAMEL COATING

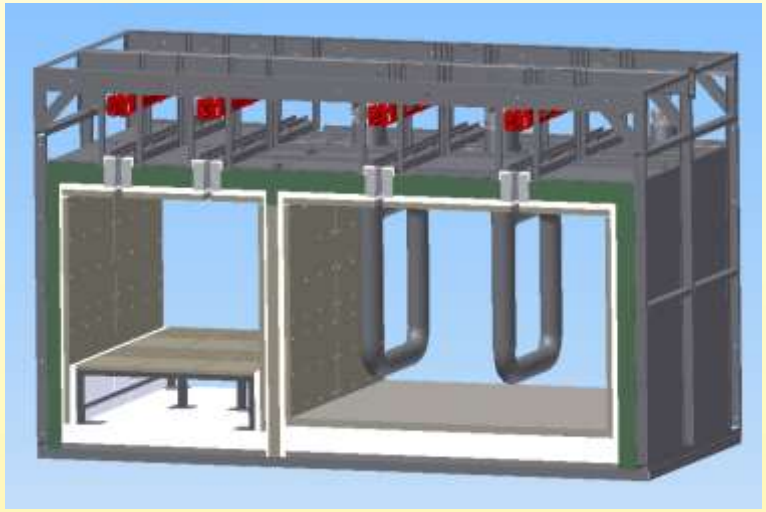
- Change-over to 2c/1f technology (wet powder or Pu-ESTA / Pu-ESTA)
- Cleaning of exhaust air by using sintered lamella filters
- Enamel reclamation
- No exhaust air is going outside – Circulating air system
- Reduction of energy costs / environmentally friendly
- Dual system cabins (2 conveyor systems)

ENAMELING FURNACES

- Energy balance – Enameling furnace

Sample 1 :

Production output	:	3.000 kg/h gross (net ~1.700 kg/h)
Capacity	:	120 firing racks / h
Speed of conveyor	:	3,2 m/min
Firing time	:	4,6 min
Length of burning zone	:	14,8 m
No. of radiant tubes	:	11 pcs
Burners	:	FLOX-recuperator burners System WS
Energy consumption	:	approx. 360 kW = 34 m³/h natural gas



1. Heat losses through isolated sidewalls, floor and roof of the furnace
   Q_{Of} = 98 kW
2. Heat losses through the open cross-section at the entrance of the furnace
   Q_{Qs} = 36 kW
3. Heat losses through the slot used for the conveyor in the roof of the furnace
   Q_{Ds} = 47 kW
4. Heat losses through the shoe plates used for covering the slot in the roof of the furnace
   Q_{Sb} = 20 kW
5. Heat losses through the firing racks (tara) as well as the carryover outwards
   Q_{Bg} = 48 kW
6. Heating up of products as well as the carryover outwards
   Q_{netto} = ca. 99 kW
7. Heating up of enamel of products – m² coated surface / thickness of enamel
   Q_E = 20 kW

- Energy consumption without products: $Q_{leer} = Q_{of} + Q_{QS} + Q_{Ds} = 181$ kW
  furnace is empty – speed of conveyor = 0 m/min
- Energy onsumption without products: $Q_{leer\ 3,2} = Q_{leer} + Q_{Sb} + Q_{Bg} = 249$ kW
  furnace is empty – speed of conveyor = 3,2 m/min
- Energy consumption = $Q_{leer\ 3,2} + Q_{netto} + Q_E = 360$ kW – during production included parts

Consumption theoretical = **360 kW = 34 m³/h** Hi = 10,63 kWh / Nm³

Installled capacity in furnace : **760 kW** (included regulation reserve for daily heating up)

Actual consumption ≅ 30 m³/h
(**Furnace in in thermally stable condition)**

Consumption of old replaced enameling furnace = 100 m³/h =>
Reduction of expenses for natural gas ~ 70 %

- **Reduction of emissions values** NO_x (nitrogen oxides) < 500 mg/m³
  CO (carbon monoxide) < 100 mg/m³
  Fluorine Absorber - Cleaning of fluorine-containing gases

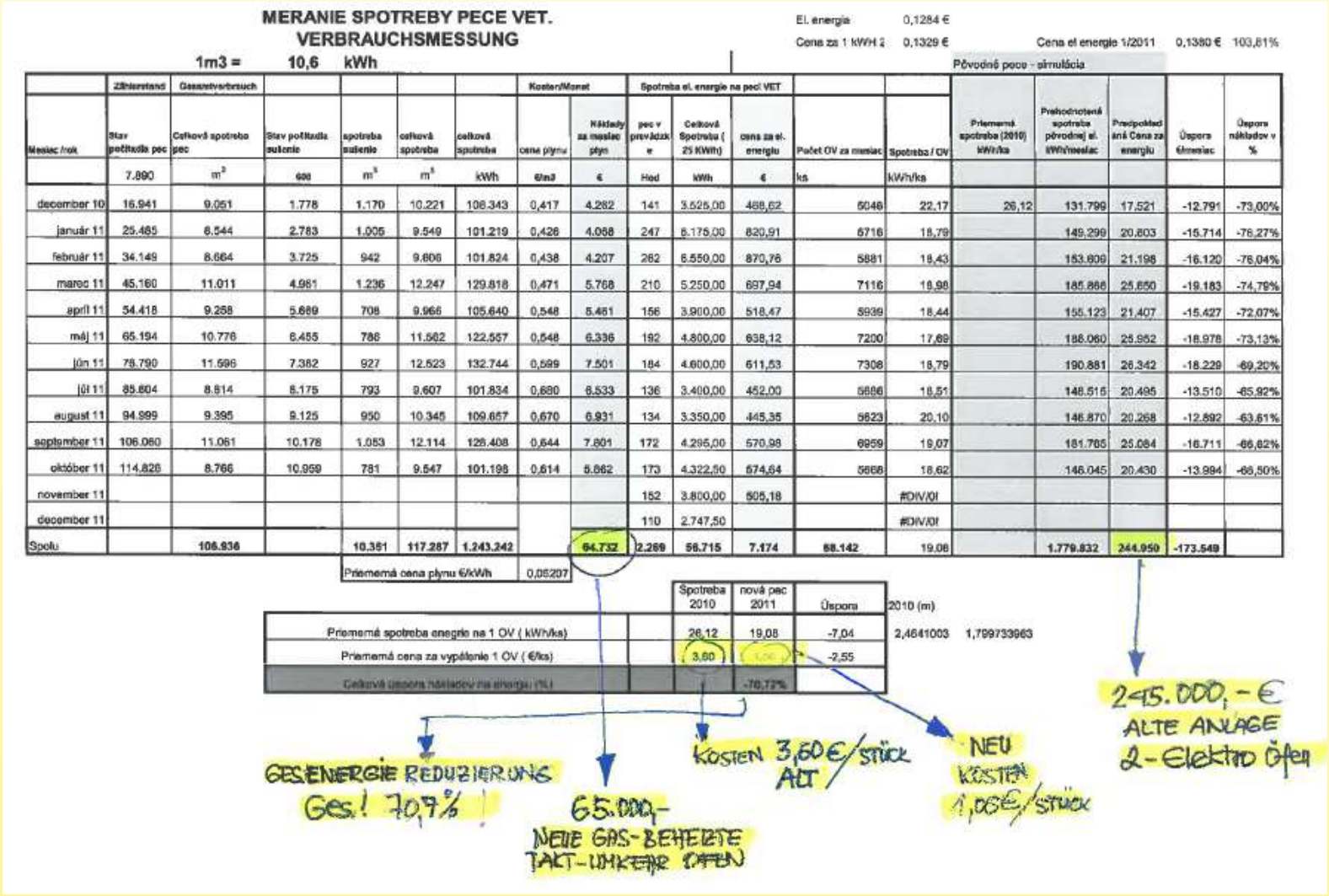
sample 2 : Boiler production
2 enameling furnaces - originally electrically heated
Reversal furnace / Stroke tunnel furnace
50 – 200 liter / 400 – 1.000 liter

Change-over of firing technology → from electrically heating to natural gas heating → one stroke tunnel furnace

Reduction of expenses for energy about 70,7 %

respectively reduction of expenses for energy / boiler
old firing technology = 3,60 € / Boiler
new firing technology = 1,06 € / Boiler

- Heating of dryer – indirectly by using heat of exhaust gas through heat exchanger



MERANIE SPOTREBY PECE VET.
VERBRAUCHSMESSUNG

1m3 = 10,6 kWh

El. energia 0,1284 €
Cena za 1 kWH 2 0,1329 €
Cena el energie 1/2011 0,1380 € 103,81%

Pôvodné pece - simulácia

Mesiac /rok	Zähierstand Stav počítadla pec	Gesamtverbrauch Celková spotreba pec	Stav počítadla sušenie	spotreba sušenie	celková spotreba	celková spotreba	Kosten/Monat cena plynu	Náklady za mesiac plyn	Spotreba el. energie na peci VET pec v prevádzke	Celková Spotreba (25 KWH)	cena za el. energiu	Počet OV za mesiac	Spotreba / OV	Priemerná spotreba (2010) kWh/ks	Prehodnotená spotreba pôvodnej el. kWh/mesiac	Predpokladaná Cena za energiu	Úspora €/mesiac	Úspora nákladov v %
	7.890	m³	600	m³	m³	kWh	€/m3	€	Hod	kWh	€	ks	kWh/ks					
december 10	16.941	9.051	1.778	1.170	10.221	108.343	0,417	4.282	141	3.525,00	468,62	5048	22,17	26,12	131.799	17.521	-12.791	-73,00%
január 11	25.485	8.544	2.783	1.005	9.549	101.219	0,426	4.068	247	6.175,00	820,91	5716	18,79		149.299	20.803	-15.714	-76,27%
február 11	34.149	8.664	3.725	942	9.606	101.824	0,438	4.207	262	6.550,00	870,76	5881	18,43		153.609	21.198	-16.120	-76,04%
marec 11	45.160	11.011	4.981	1.256	12.247	129.818	0,471	5.768	210	5.250,00	697,94	7116	16,98		185.866	25.650	-19.183	-74,79%
apríl 11	54.418	9.258	5.689	708	9.966	105.640	0,548	5.461	156	3.900,00	518,47	5939	18,44		155.123	21.407	-15.427	-72,07%
máj 11	65.194	10.776	6.455	766	11.562	122.557	0,548	6.336	192	4.800,00	638,12	7200	17,69		188.060	25.952	-18.978	-73,13%
jún 11	75.790	11.596	7.382	927	12.523	132.744	0,599	7.501	184	4.600,00	611,53	7308	18,79		190.881	26.342	-18.229	-69,20%
júl 11	85.604	8.814	8.175	793	9.607	101.834	0,680	6.533	136	3.400,00	452,00	5686	18,51		148.515	20.495	-13.510	-65,92%
august 11	94.999	9.395	9.125	950	10.345	109.657	0,670	6.931	134	3.350,00	445,35	5623	20,10		146.870	20.268	-12.892	-63,61%
september 11	106.060	11.061	10.178	1.053	12.114	128.408	0,644	7.801	172	4.295,00	570,98	6959	19,07		181.765	25.084	-16.711	-66,62%
október 11	114.826	8.766	10.959	781	9.547	101.198	0,614	6.662	173	4.322,50	574,64	5666	18,62		146.045	20.430	-13.994	-68,50%
november 11									152	3.800,00	505,18		#DIV/0!					
december 11									110	2.747,50			#DIV/0!					
Spolu		106.936		10.361	117.287	1.243.242		64.732	2.269	56.715	7.174	68.142	19,06		1.779.832	244.950	-173.549	
				Priemerná cena plynu €/kWh			0,05207											

	Spotreba 2010	nová pec 2011	Úspora
Priemerná spotreba energie na 1 OV (kWh/ks)	26,12	19,08	-7,04
Priemerná cena za vypálenie 1 OV (€/ks)	3,60	1,05	-2,55
Celková úspora nákladov na energiu (%)			-76,72%

2010 (m) 2,4641003 1,799733963

GESENERGIE REDUZIERUNG Ges.! 70,9%!

65.000,- NEUE GAS-BEHEIZTE TAKT-UMKEHR ÖFEN

KOSTEN 3,60 €/STÜCK ALT

NEU KOSTEN 1,05 €/STÜCK

245.000,- € ALTE ANLAGE 2-Elektro Öfen

EMAIL-TAGUNG PORTOROŽ
19 - 23.09.2016

VET - GmbH
Vitreous Enamel Technique

CLOSING REMARK

We hope that we have given you with our presentation a brief overview about the opportunities in energy savings during enamel processing, so that you are – together with us - able in future to contribute to the use of environmentally friendly technologies.

For futher detailed **information** please do not hesitate to contact us.

Thank You for Your attention !

EMO FRITE

Physical and chemical processes in the modulation of enamel properties

PHYSICAL AND CHEMICAL PROCESS IN THE MODILATION OF ENAMEL PROPERTIES

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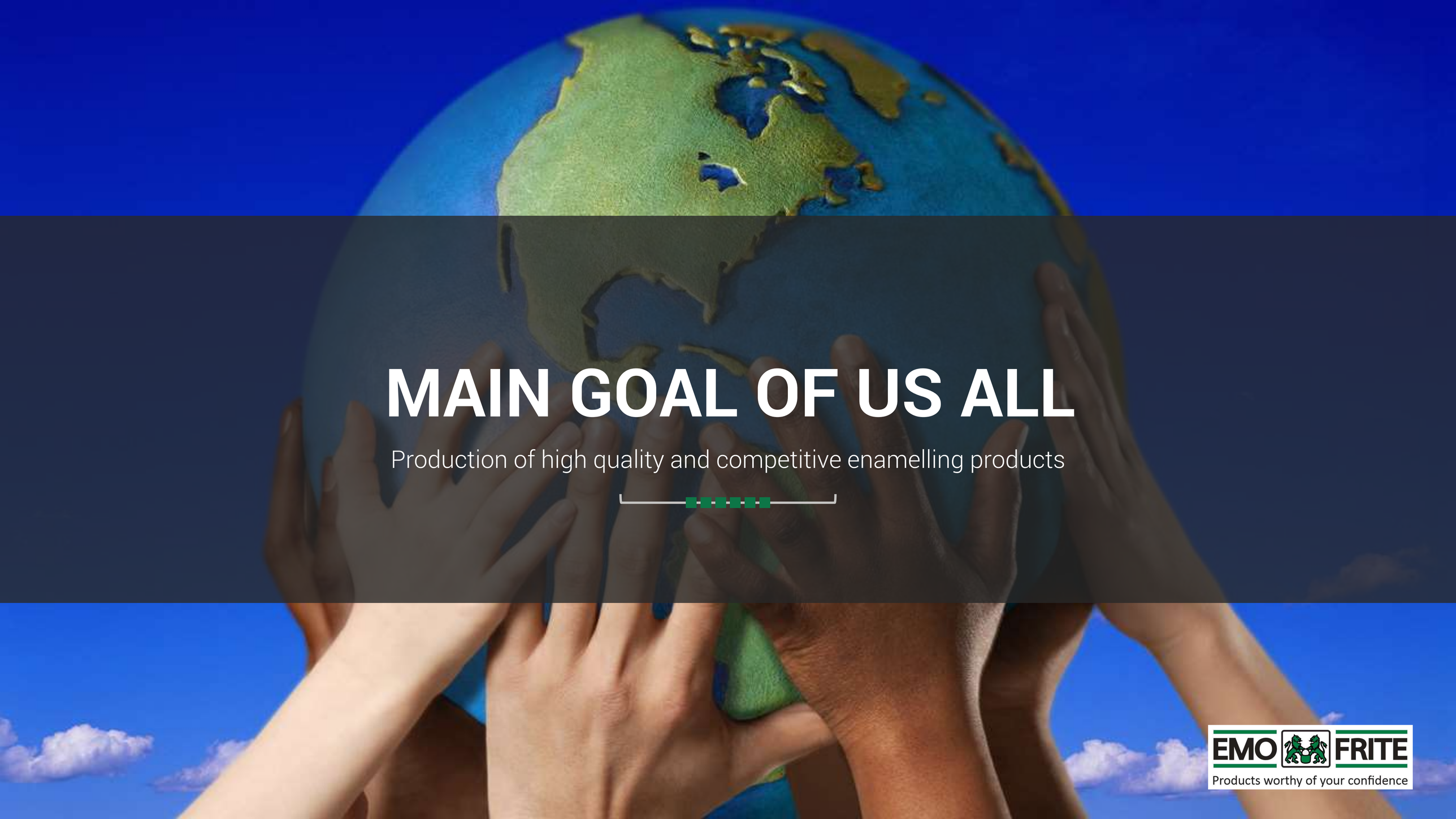
Sabina Šumnik and Oksana Shalygina



MAIN GOAL OF US ALL

Production of high quality and competitive enamelling products

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WATER HEATERS

EMO FRITE
Products worthy of your confidence

COOKERS

EMO FRITE

Products worthy of your confidence

DISHES

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Products worthy of your confidence

ENAMELED ARCHITECTURAL BUILDING PANELS

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Products worthy of your confidence

SANITARY WARE

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Products worthy of your confidence

FIREPLACES STOVES STOVEPIPES

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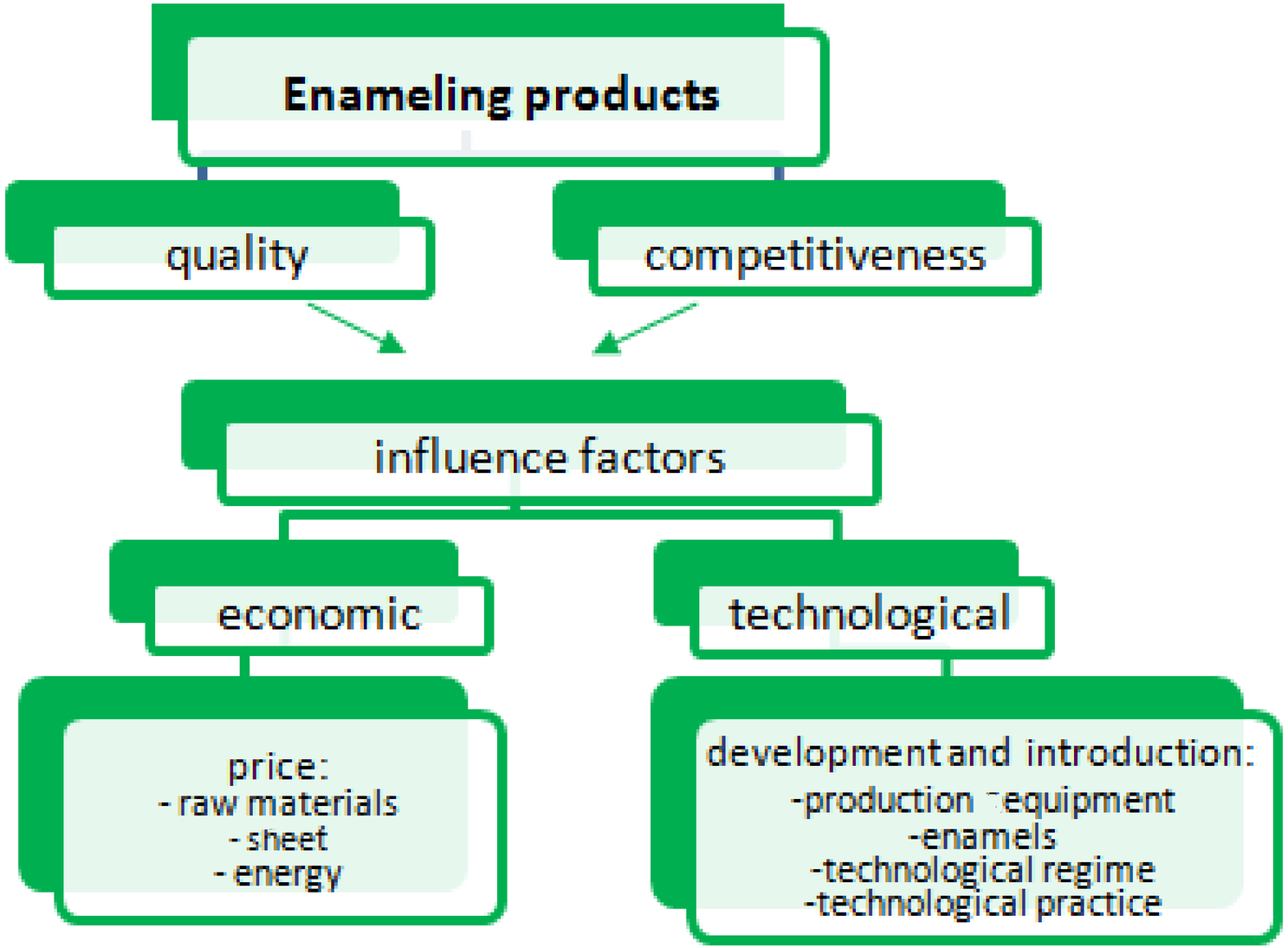

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CHALLENGES

we meet nowadays

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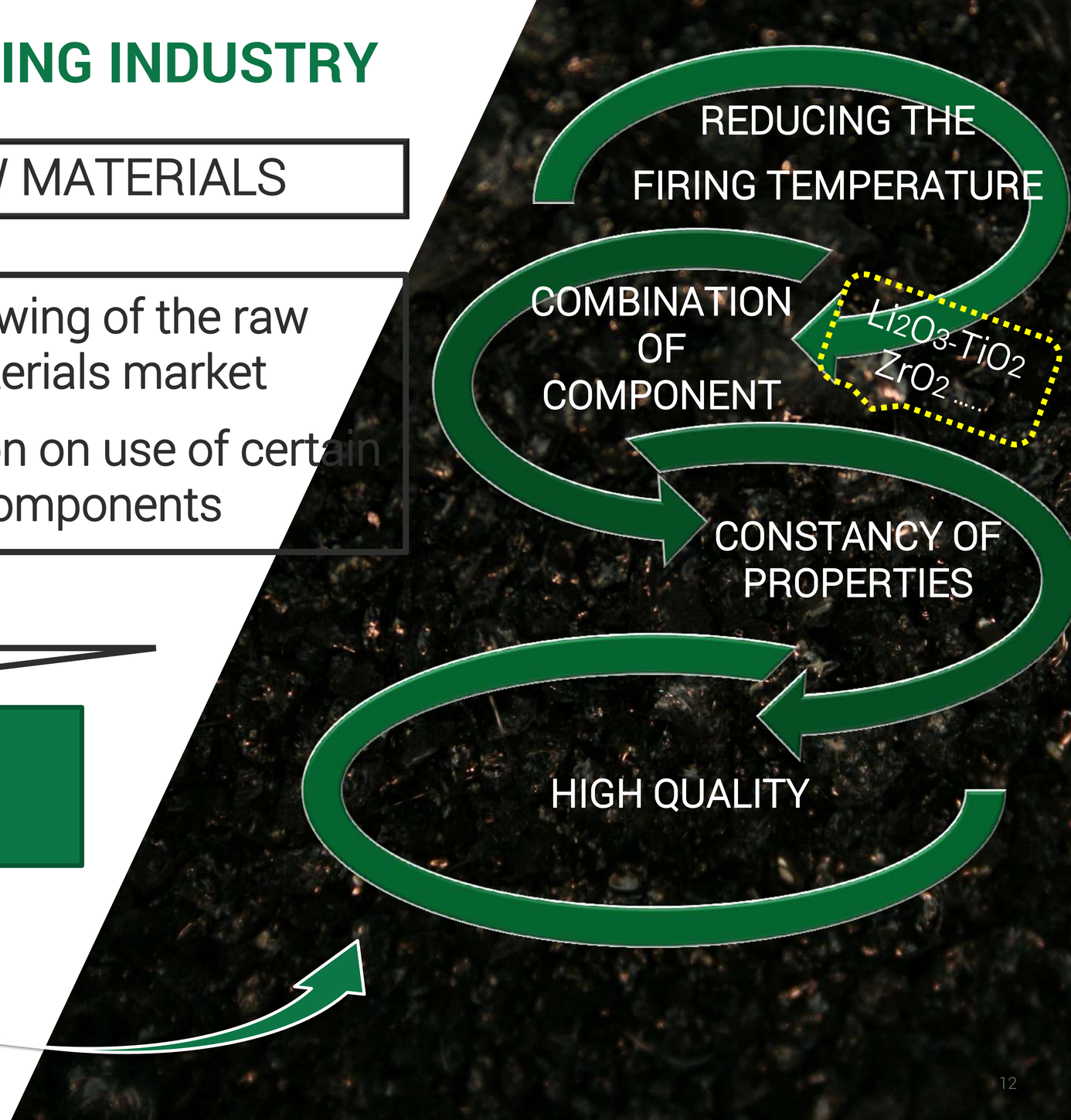
CHALLENGES IN THE ENAMELING INDUSTRY

ENERGY	RAW MATERIALS
Price of Energy	Narrowing of the raw materials market Restriction on use of certain components

DEVELOPMENT

Resource – energy saving technology



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HOW DO WE FIND SOLUTIONS?

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Active development and production

Environmental regulations and requirements

The quality control system and technological characheristic

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FAST RESPONSE

•OBJECTIVE FACTORS

•SUBJECTIVE REQUIREMENTS

COOPERATION

•TECHNOLOGISTS

•EXPERTS

•UNIVERSITIES

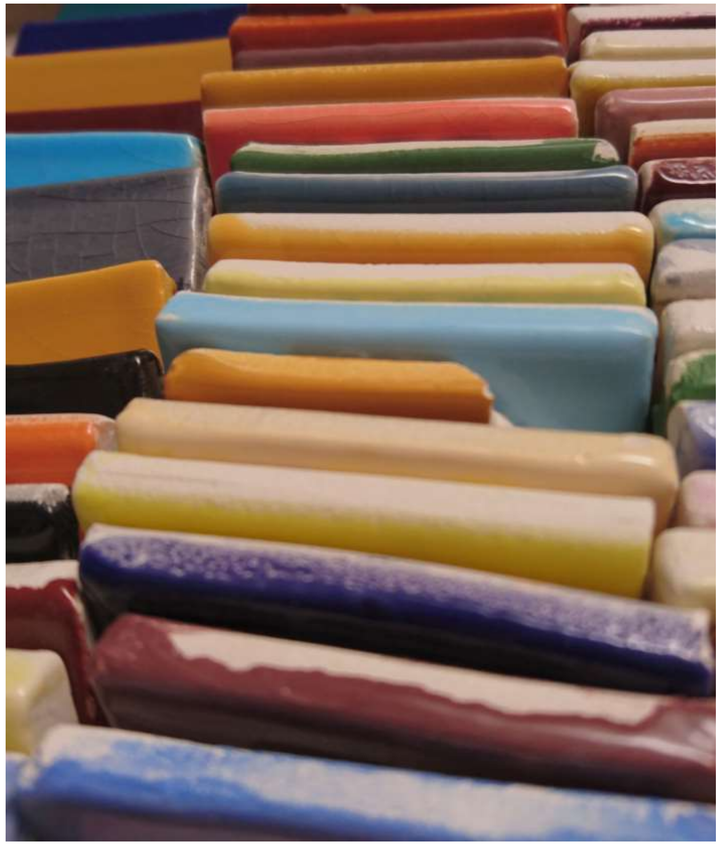
DEVELOPMENT

•NEW TYPES OF ENAMELS

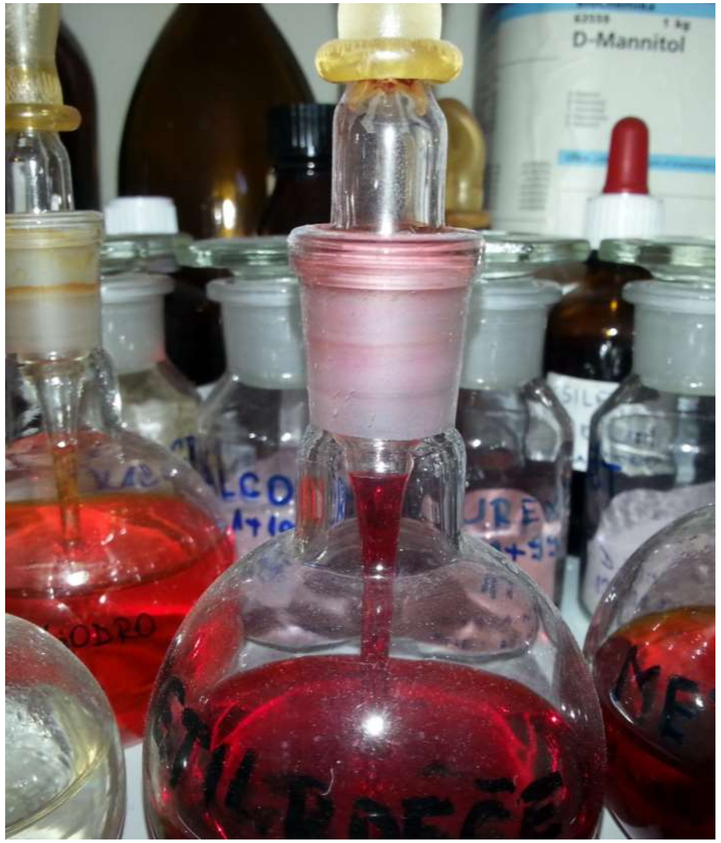
•NEW COMPOSITIONS AND PROPERTIES

LABORATORIES IN EMO FRITE

ENAMEL LABORATORY



CERAMIC LABORATORY



ANALYTICAL LABORATORY

METHODOLOGY AND PRINCIPLES OF DEVELOPMENT

PRODUCTION PRINCIPLES

- Technological characteristics of production

SCIENTIFIC PRINCIPLES

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

TRENDS AND DIRECTIONS

- Economic factors
- New guidelines

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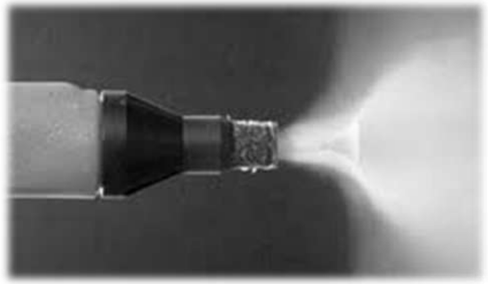
THE STARTING POINTS OF DEVELOPMENT

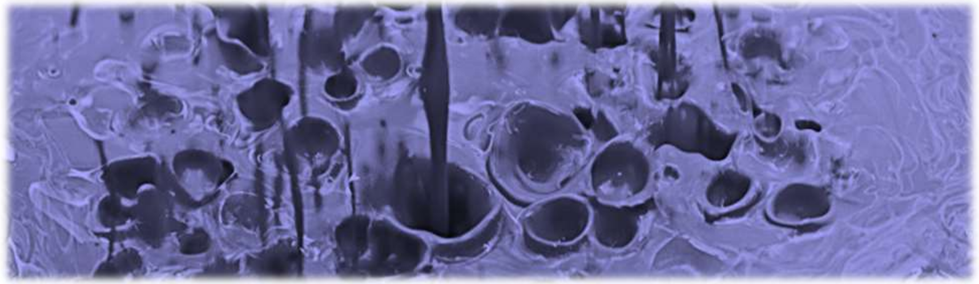
Type
Purpose

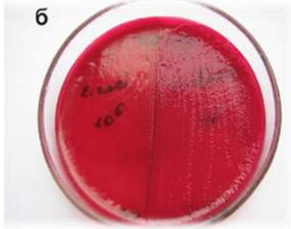
Properties:
•technological
•operative

Enamel
coating
technology

Sheet
Regimes
Color







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ENAMEL PROPERTIES

OPERATIVE

- resistance to various reagents (chemical resistance)
- temperature resistance
- adhesion)
- colour
- texture

and etc.

TECHNOLOGICAL

wet technology

Parameters of slip:

- specific weight
- opacity
- droping time
- fineness of grinding

POESTA

Parameters of powder:

- electrical resistance
- electrostatic adhesion
- fluidization
- fineness of grinding

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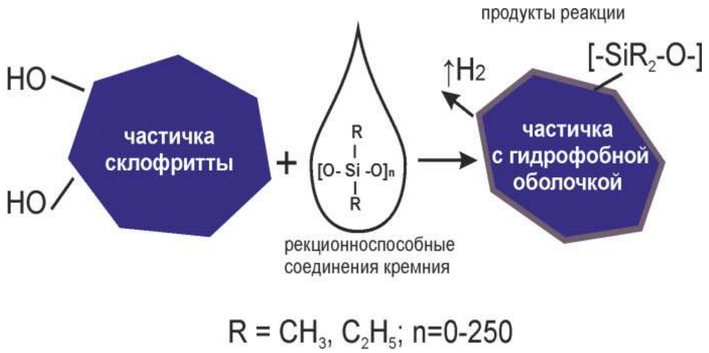
TECHNOLOGICAL PROPERTIES

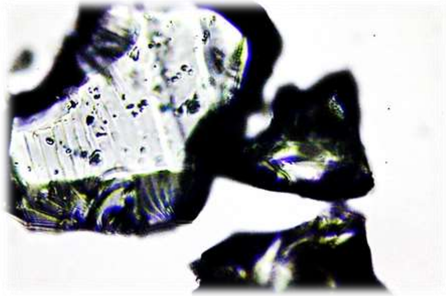
innovative technologies

POESTA TECHNOLOGY

one-step encapsulation

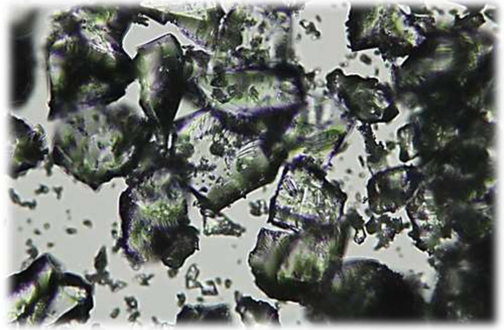


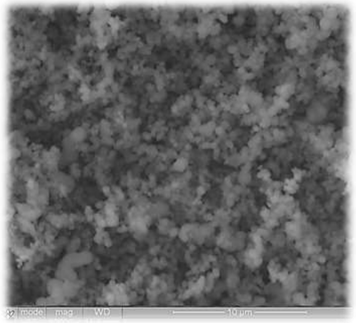
$R = CH_3, C_2H_5$; n=0-250



WET TECHNOLOGY

reinforcement of slip suspensions





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OPERATIVE PROPERTIES OF ENAMELS

CHEMICAL RESISTANCE

- hot water
  water steam
- solutions of acids
  and salts
- solutions of
  alkalis
- weathering

ADHESION

- impact strength
- bending strength
- torsion

DECORATIVE CHARACTERISTICS

- color
- texture
  characteristics
- optical characeristic

SPECIAL CHARACTERISTICS

- antibacterial
- pyrolyric
  catalytic
- reflective

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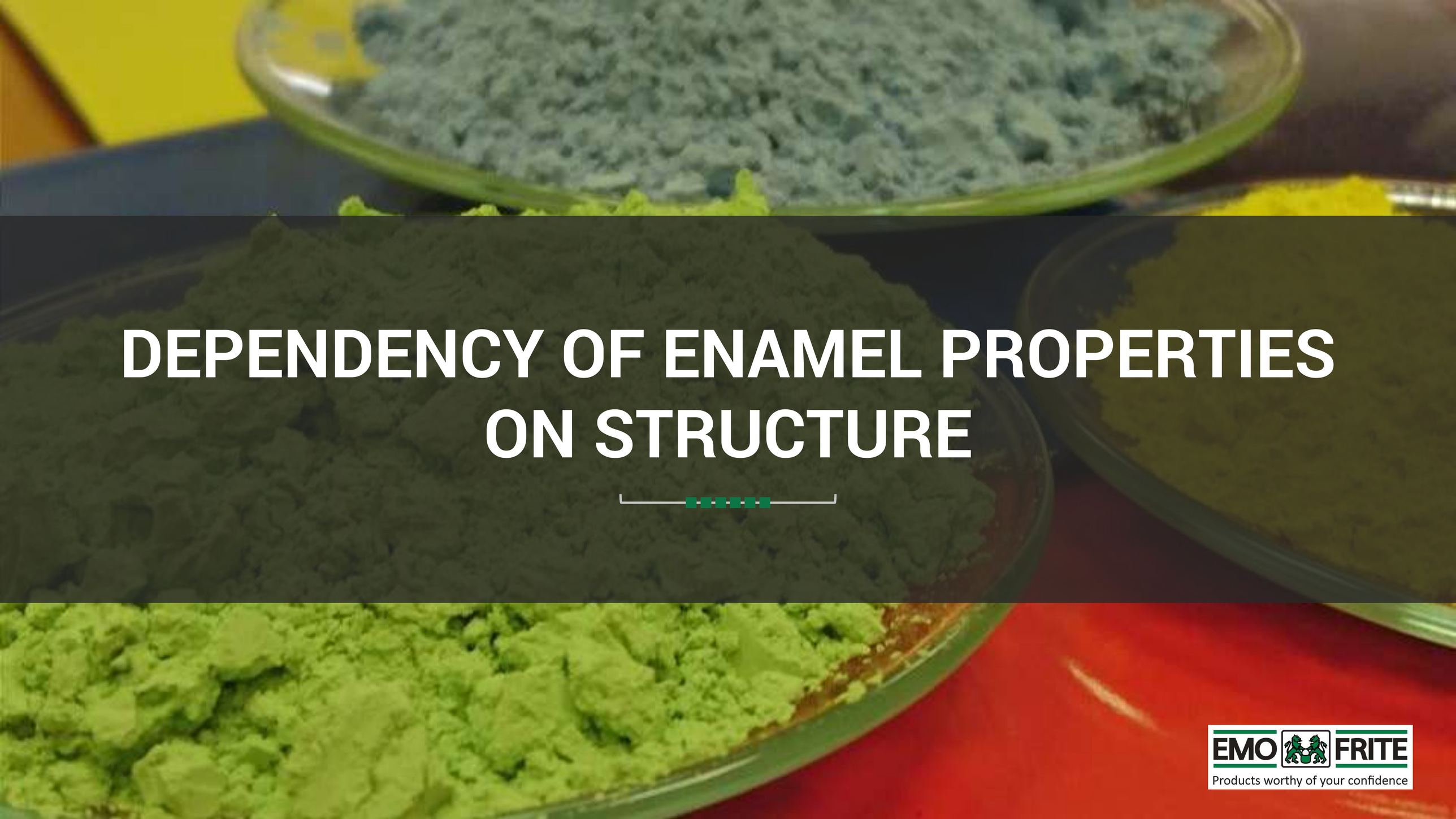

DEPENDENCY OF ENAMEL PROPERTIES ON STRUCTURE

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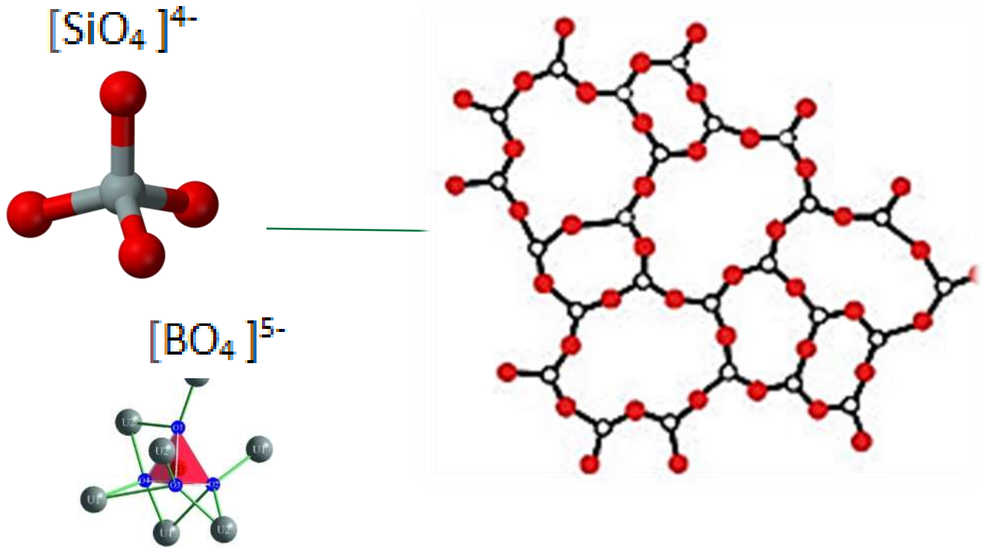
STRUCTURE OF ENAMEL



FRIT

Key komponent of enamel

BOROSILICATE GLASS

Main structure elements are (SiO 4) $^{4-}$ and (BO 4) $^{5-}$

- R2O-RO-B2O3-SiO2

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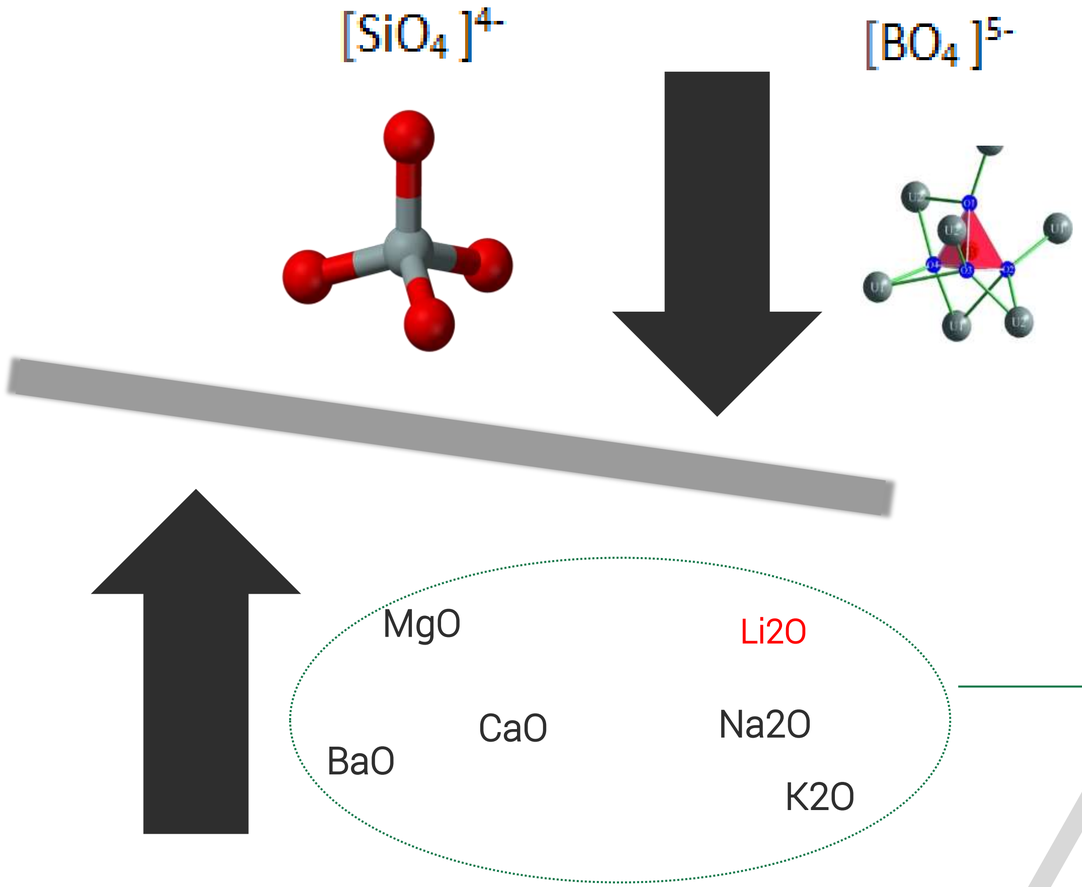
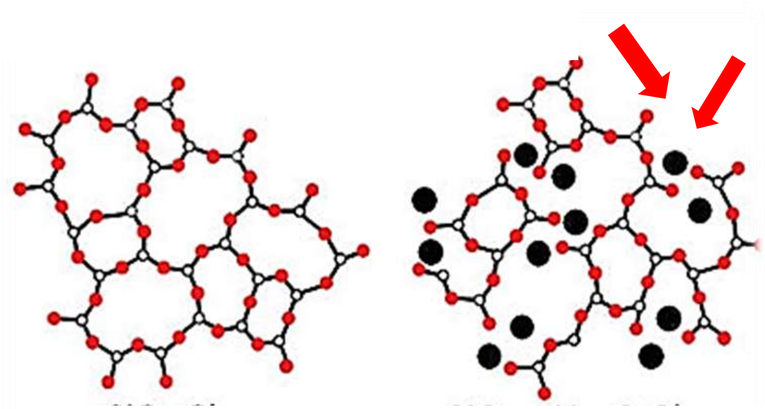


MODIFIERS

Change the properties of enamel



Regulate:

-interactions between fused glass and metal substrate

-chemical and thermal characheristic

-optical and textural characeristic

-electrical properties

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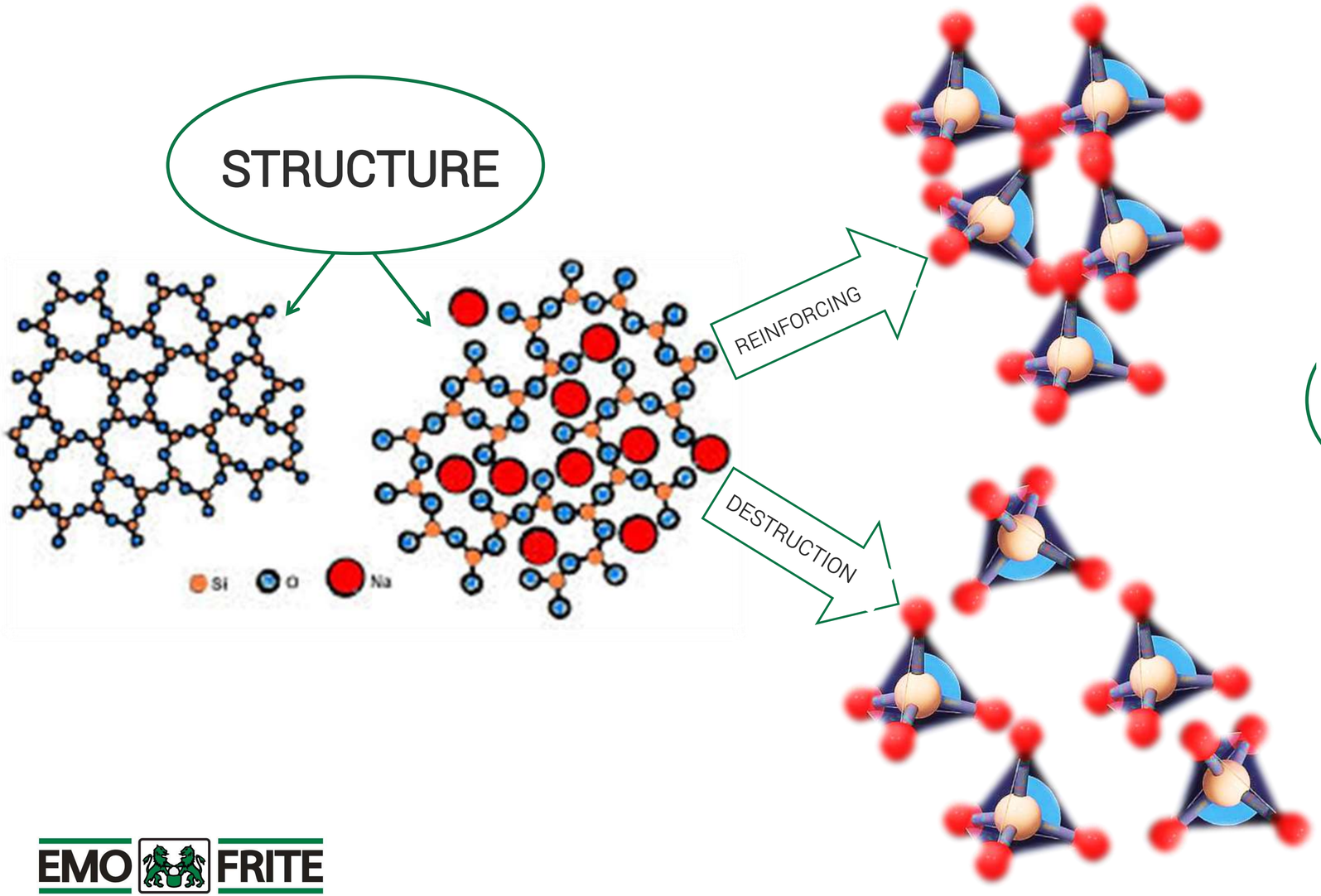
IMPACT OF MODIFIERS ON PROPERTIES OF ENAMEL



↑ CHEMICAL RESISTANCE

↑ MELTING TEMPERATURE

PROPERTIES

↓ MELTING TEMPERATURE

↓ CHEMICAL RESISTANCE

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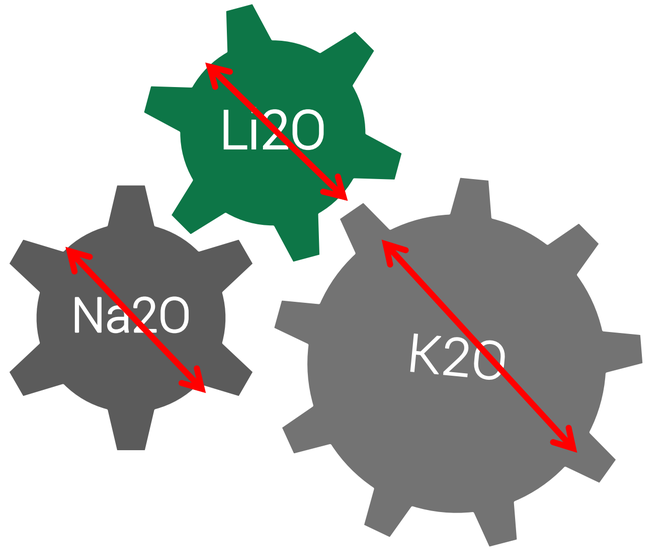
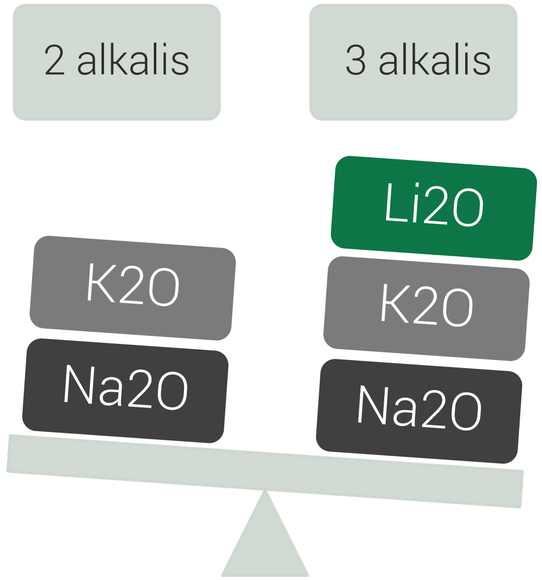
OUR SOLUTIONS

POLYCATIONIC EFFECT



THE ESSENCE OF THE PROCESS - braking of intrastructural ion motions.



THE RESULT OF THE PROCESS:

- decreasing of firing temperature and viscosity
- increasing of chemical and electrical resistance

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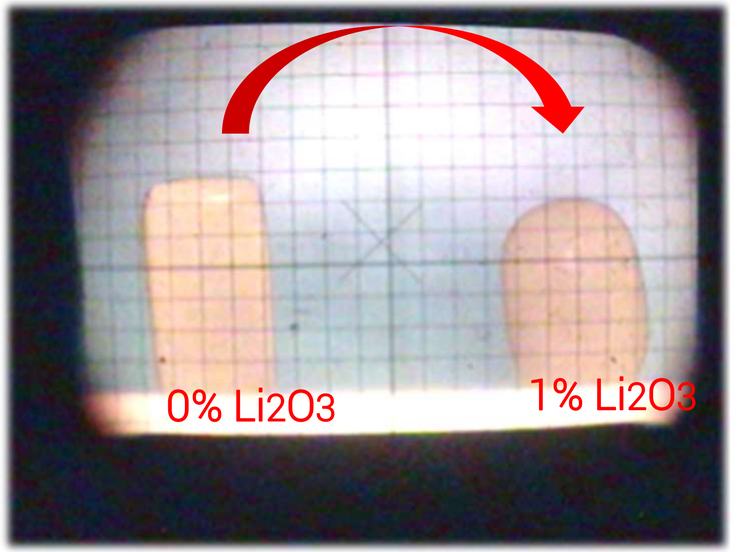
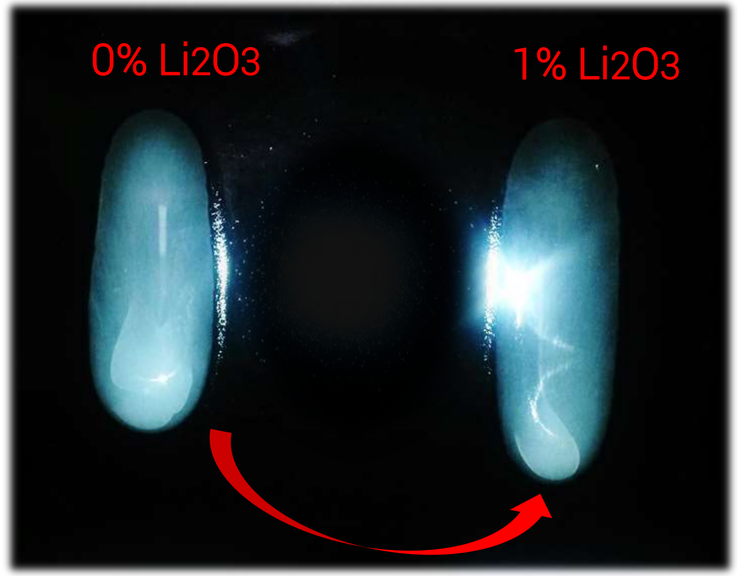
LITHIUM

- Strong influence on polycationic effect,
- highly reactive→strong fluxing potenical,
- reducing viscosity,
- giving better flow characeristic,
- reducing firing temperature,
- increase of bonding forces in glass structure.
- Improves:
  - chemical resistance (acids and alkaline resistance)
  - thermal resistance
  - water and steam resistance

Element	Ionic radius (Å)	Ionic potential
Lithium	0,60	1,67
Sodium	0,95	1,05
Potassium	1,33	0,75





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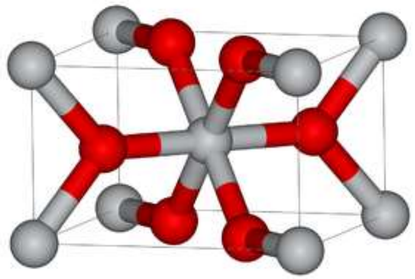
TITANIUM



- Modifier or glass former,
- hot water and steam resistance,
- increases the chemical resistance,
- increases the strength and hardness of enamel,
- reduces the porosity,
- improves the properties of white enamels.

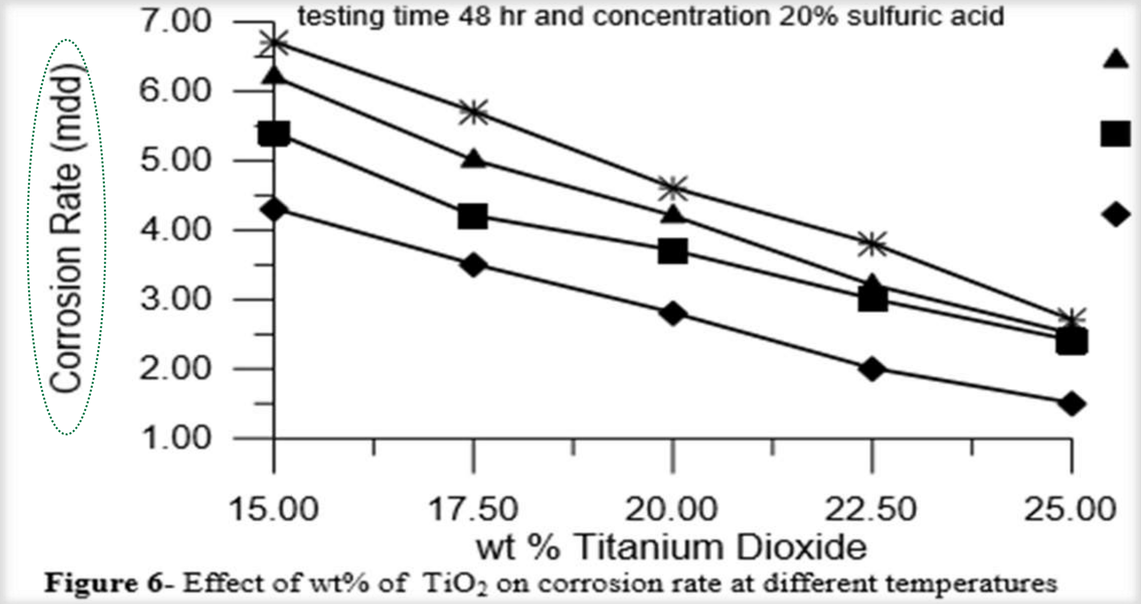


Figure 6- Effect of wt% of TiO_2 on corrosion rate at different temperatures

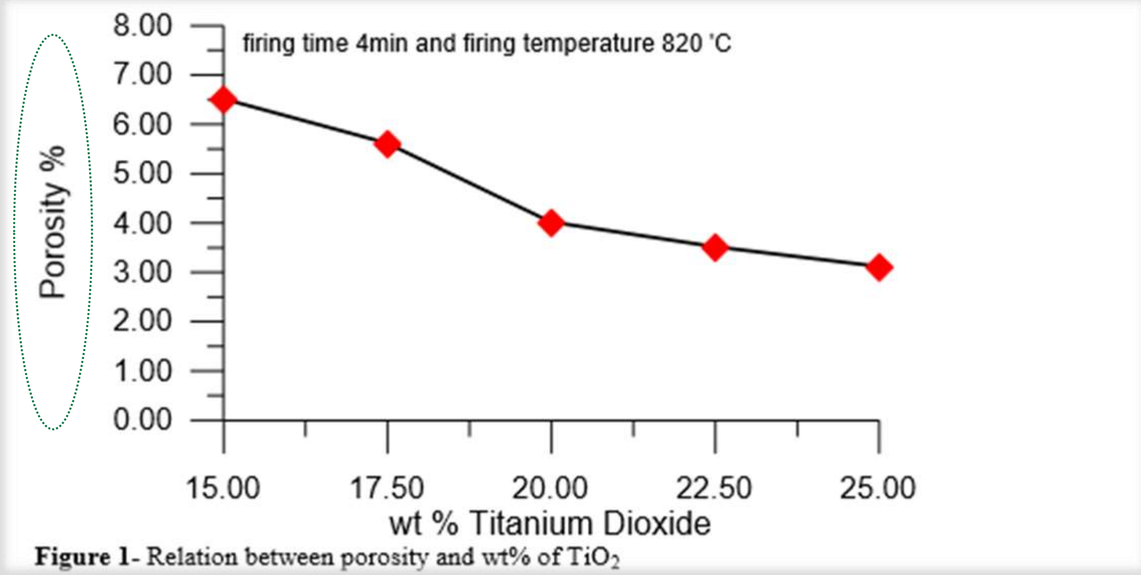


Figure 1- Relation between porosity and wt% of TiO_2

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GOALS OF EMO FRITE

Quick response on the needs and wishes of our partners

Development, production and sale of high quality products

PRIORITY OF EMO FRITE

Stability of quality and competitiveness of products

POTENCIAL OF EMO FRITE

Expanding of production, scientific and practical potential, knowledge and experiences

TEAM OF EMO FRITE

We are united by the passion for work and enamels

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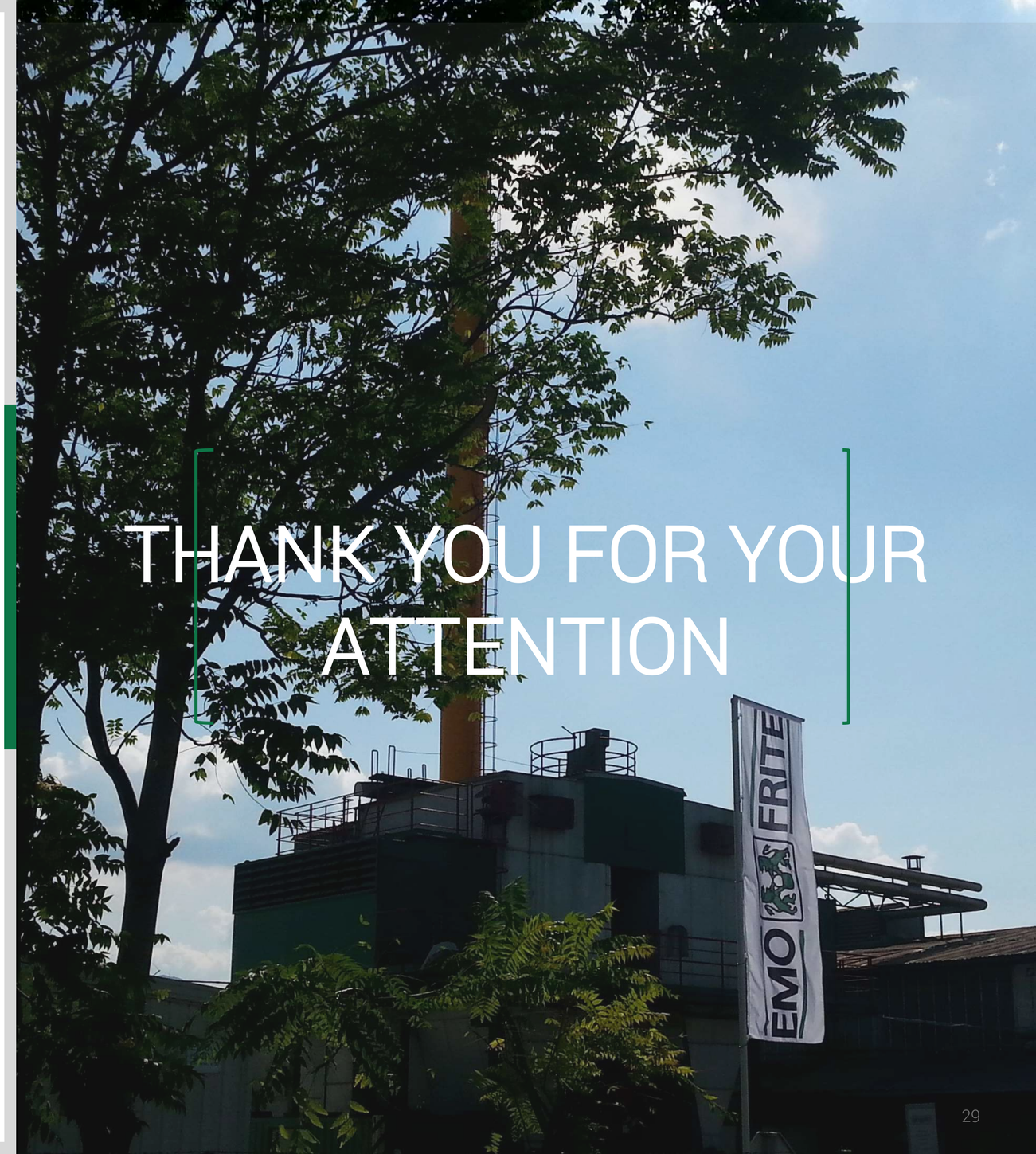


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