LAMPART®
ENAMELLING TECHNOLOGY IN CHINA

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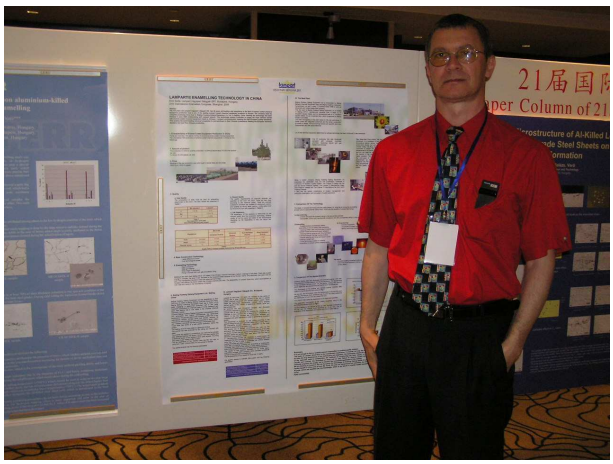

XXI International Enamellers Congress

18-22 May 2008 Shanghai - China

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21th International Enamellers Congress, Shanghai, 2008

ABSTRACT

The 120 years old Lampart Vegyipari Gépgyár Rt. has 60 years old tradition and experience in the field of enamel coated chemical equipment production and is one of the leading enamel coated chemical equipment producer in Europe. The company sold his complete producing know-how to Beijing Huateng Datang Equipment Co. Ltd. in Beijing, China. Starting the technology has been finished in June 2005 collaborating with Lampart experts. This technology makes it possible to supply the huge Chinese market with enamel coated chemical equipment made by Chinese – Lampart coo-production, meeting the high European quality standards. This enables the world leading chemical companies to use machinery in their Chinese investments meeting the European technical standard, but now from Chinese production.

I. CHARACTERISTICS OF ENAMEL COATED EQUIPMENT PRODUCTION IN CHINA

There are more than 100 plants in China to produce enamel-coated chemical equipment. The characters of the production of enamel-coated chemical equipments in China are the followings:

1. **Amount of product**

   The production in China is quantity production.

   In China produce about 70.000 tons product per year.

   It is about 32.000 peaces per year.

2. **Price**

   Because of the low production costs and buyer's market there are low prices.

   (8000 Euro / 6000 lit vessel)

3. Quality

a. *Steel Quality*

The composition of steel must be used for enamelling determined by BG norm. The main values are presented in ***Table 1***.

	BG standard	Lampart
C	< 0,19	< 0,12
Mn	-	< 0,4-1,2
P	< 0,04	< 0,035

Table 1:
The composition of the steel determined by BG norm and Lampart

b. *Enamel Quality*

The quality requirements of chemical enamels are specified by the norm HG 2432. There are free class according to the chemical stress. There are enamels suitable for universal use, suitable for strong acid medium and suitable for strong alkali medium. Limits determined by HG and EN norm are presented in ***Table 2.***

RESISTANCE		EN 15159	HG 2432		
		UNIVERSAL ENAMEL	UNIVERSAL ENAMEL	ACID RESISTANT ENAMEL	ALKALI RESISTANT ENAMEL
ACID	mm/year	≤ 0,08	≤ 0,23	≤ 0,07	≤ 0,43
ALKALI	mm/year	≤ 0,40	≤ 0,73	≤ 1,17	≤ 0,36
THERMAL SHOCK	°C	≥ 190	≥ 200	≥ 180	≥ 180

Table2:
Quality limits of chemical enamels determined by HG and EN norm

c. *Life Expectancy*

Life expectancy of the products is determined by the enamel quality and the production technology. Enamel quality is not too good and there is low technological discipline, so life expectancy is very low (about sex month).

4. **Base Construction Technology**
    - Large difference of level
    - Low technological duress
5. **Enamelling Technology**
    - Able to advance
    - Steel grit blasting
    - Wide range of application
    - Firing in furnace with coal, gas and electric firing

Beitang's new plant near Beijing has a 12% stake in the Chinese chemical machinery market. It belongs to the bests. There was a great change in company life when it was relocated to the industrial estate because of the Olympic Game. One absolutely new plant must be built. The management decided to start one advanced technology.

Hungary has opened the doors toward the Chinese economy just then. The adaptability of Lampart know-how, which accomplished at now, was born owing to the coincidence of interests.

II. Beijing Huateng Datang Equipment Ltd., Beijing, China

Beijing Huateng Datang Equipment Ltd was established on April 2003 and its matrix is Beijing Beitang Chemical Equipment Plant. Beijing Beitang Chemical Equipment Plant has a history of 50 years engaging in glass-lined production and it has made important contributions to chemical trade of China. Beitang's new plant near Beijing has a 12% stake in the Chinese chemical machinery market.

Currently Beijing Huateng Datang Equipment Ltd possesses about 300 employees and mainly manufactures big glass-lined equipments. The annual yield of this company is 4500 tons. It can manufacture 60000L storage tanks and 40000L reactors. Its products are sold throughout China and exported to Japan, Indian, Iran, Thailand, Indonesia and the countries of North-east Asia.

There were high levels of a grey goods production before the project.

The melting of the frit was made in a glass-pot furnace.

The enamel slip was produced by dry milling and remixed with water.

The enamel slip applied by conventional one coat one fire process. After steel-grit-blasting one layers of grand coat were applied and 4 additional layers of acid resistant layers were applied. The firing was made in gas heated muffle furnace.

The life expectancy of the vessels made like this way was no more than 1 year. Unfortunately it is not enough in Europe.

The applied enamel has the following parameters:

Acid resistance (EN 14483-2)	**0,25 mm/year**
Alkali resistance (EN 14483-4)	**1,04 mm/year**
Thermal shock resistance (ISO 13807):	**210 °C**
Characteristics of the applied enamel	

III. LAMPART VEGYIPARI GÉPGYÁR ZRT., BUDAPEST, HUNGARY

Lampart is more than 100 years old company at the centre of Europe with a great producing practice in the field of enamel coated chemical equipment and applied enamel system, which meets the high-quality requirements. Lampart mainly supplies various series of 30L~10000L of glass-lined vessels, tanks and their accessories. Its products are sold throughout Hungary and European Community, exported to al over the world.

Lampart has its own technique for smelting the mixture of raw materials in drum furnace into a glass-frit at a temperature of 1400°C. In this way samples are continuously analysed and compared with given standards in order to guarantee a consistent quality.

The enamel-slip is produced by wet milling according to the special milling formula and rigorously tested before being used in the enamelling process. Meticulous preparation of the steel required to ensure the good quality finish.

The enamel slip is applied conventional one coat one fire technique. After fabrication and corundum-grit-blasting of the steel two layers of grand coat are applied and 4 additional layers of acid resistant layers are applied. Each layer being dried and fired at 800-930°C, and gradually cooled.

In manufacturing process we introduce a control points for measuring the base coating thickness and in all peaces keep it not more than 0,5 mm in order to guarantee the uniform resistant coating thickness and stress condition.

Each step of smelting, grinding and enamelling is continuously monitored. Each layer of the coating is being exactly examined in order to find possible faults that are being removed immediately.

The results of this systems approach to our entire glass-enamelling process yield a product, which provides exceptional service in most adverse circumstances.

The life expectancy of our vessels is more than 10 years.

The applied enamel is UNIVER S99 system with the following parameters:

Acid resistance (EN 14483-2)	**0,07 mm/year**
Alkali resistance (EN 14483-4)	**0,35 mm/year**
Thermal shock resistance (ISO 13807):	**240 °C**
Characteristics of UNIVER S99 enamel coating	

IV. THE NEW PLANT

Beijing Huateng Datang Equipment Ltd is incorporated by Beijing Beitang Chemical Equipment Plant and Beijing Huateng Investment-Development Ltd and it costs 1.2 hundred million RMB to build an advanced and modern glass-lined company.

The new palnt of Beijing Huateng Datang Equipment Ltd is located in Beijing OPTO－mechatronics industrial Park. It takes up 67 thousand square meters and its architectural area is 27 thousand square meters. It is an investment item, which is approved by Beijing Project Committee.

The chief ichnography of the plant based on the new technology. It builds united and integrated workshops and the whole construction is novelty in shape. The surroundings around are beautiful and it is a characteristic and new style enterprise.

Lot of new technical equipment determined by Lampart technology has been introduced in new workshops.

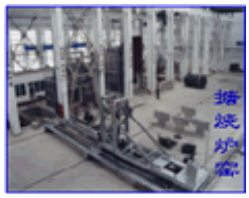
One frit producing line was introduced equipped with computer controlled automatic measuring device and gas heated drum furnace.





New glass-lined firing product line was introduced. It is composed of five high temperature electric stoves, two heat preservation stoves, and one load and unloads trolley. The firing stoves adopt computers to inspect and control the temperatures of the stoves automatically and this can make the temperatures in the districts of the stoves reach the higher precision. The temperatures of the work-piece in the stoves may automatically be raised, lowed and preserved with the technologic curve of firing temperatures set by the program and this greatly guarantees the firing quality.






Being a modern company, Beijing Huateng Datang Equipment Ltd possesses four certificates. They are The Qualification Certificate of Conformity Of ISO9001 Qualify System, The License To design the first and the second Pressure Vessels, The License To Manufacture Glass-lined Pressure Vessels and The License To Manufacture the third (AR2) Pressure Vessels.

It also has the perfect constitutions of modern management and production-organization and the system of quality assurance.

1. Comparison Of The Technology

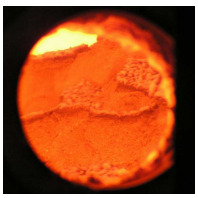
The bases of Lampart technology are the quality aspect.

All, what we do during the enamelling process acts for good enamel quality finish.

Which are the benefits of Lampart technology:

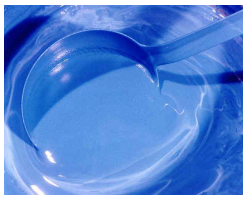
In frit producing:

- Enamel composition guarantee European quality
- Melting technology guarantee uniform quality

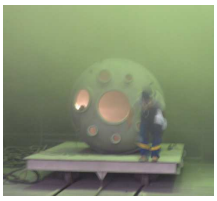

In slip producing:

- Uniform and good slip property owing to the wet grinding process
- Appropriate, uniform and reproducible consistency and set up properties owing to using appropriate materials and wet grinding



In enamelling:

- Suitable surface pre-treatment before enamelling to ensure default free enamelling
- Applying limited base coat thickness to ensure suitable bubble structure and good adhesion
- Applying special spraying and firing technique to ensure strength line free enamel-coating
- Special applying and firing technique to avoid cracking in small radii.
- Firing technology suitable for enamel composition to ensure uniform enamel quality




The results

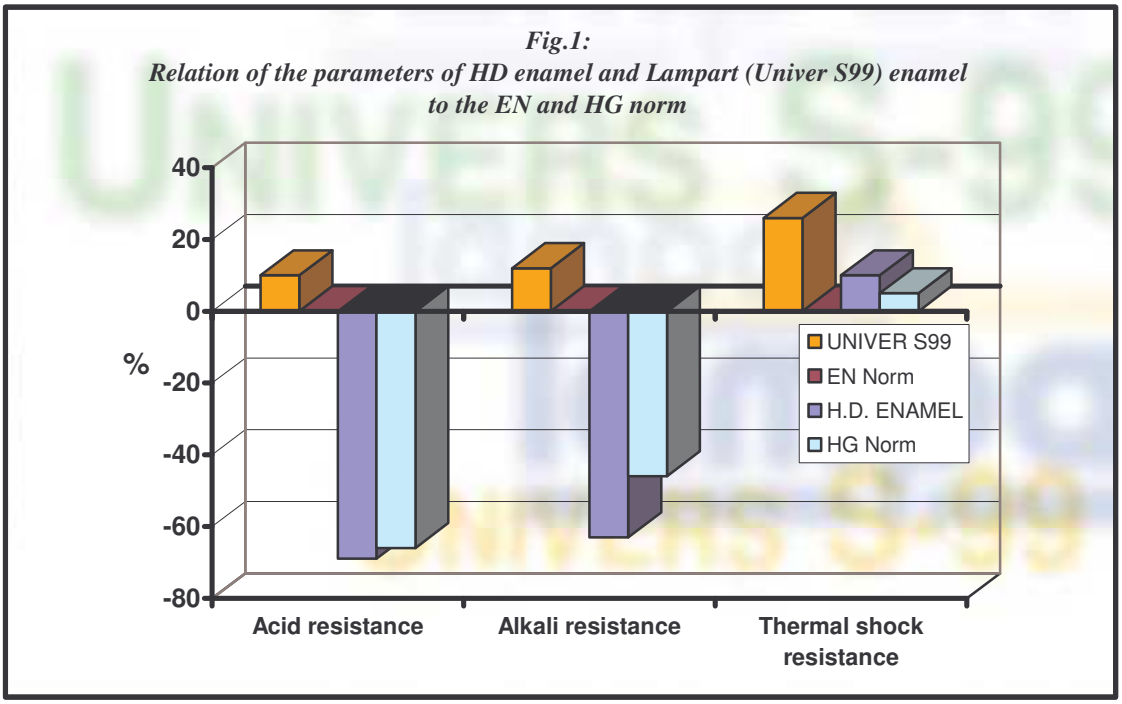
- Excellent coating properties (chemical resistance) thanks to the new enamel composition
- Improving of life expectancy owing to the Lampart technology
- Quality aspect

2. Comparison Of The Applied Enamels

Huateng Datang used own developed and produced enamel in the past. The properties of these enamel met the HG standards. The requirements of HG standards become strictly. So the enamel coating was required which meets the new requirements and the EN norm simultaneously.

The parameters of HG enamel and Lampart enamel (UNIVER S99) relation to the EN and HG norm show on ***Fig.1***.

Fig.1:
Relation of the parameters of HD enamel and Lampart (Univer S99) enamel to the EN and HG norm



We can see, that HD enamel meets the requirements of HG and EN norm regarding the thermal shock resistance only. Its acid- and alkali-resistance are nearing the HG norm and are missed EN norm.

The UNIVER S99 meets the requirement to all intents and purposes.

The expectable improvement of the coating properties owing to the technological change shows on ***Fig.2***.

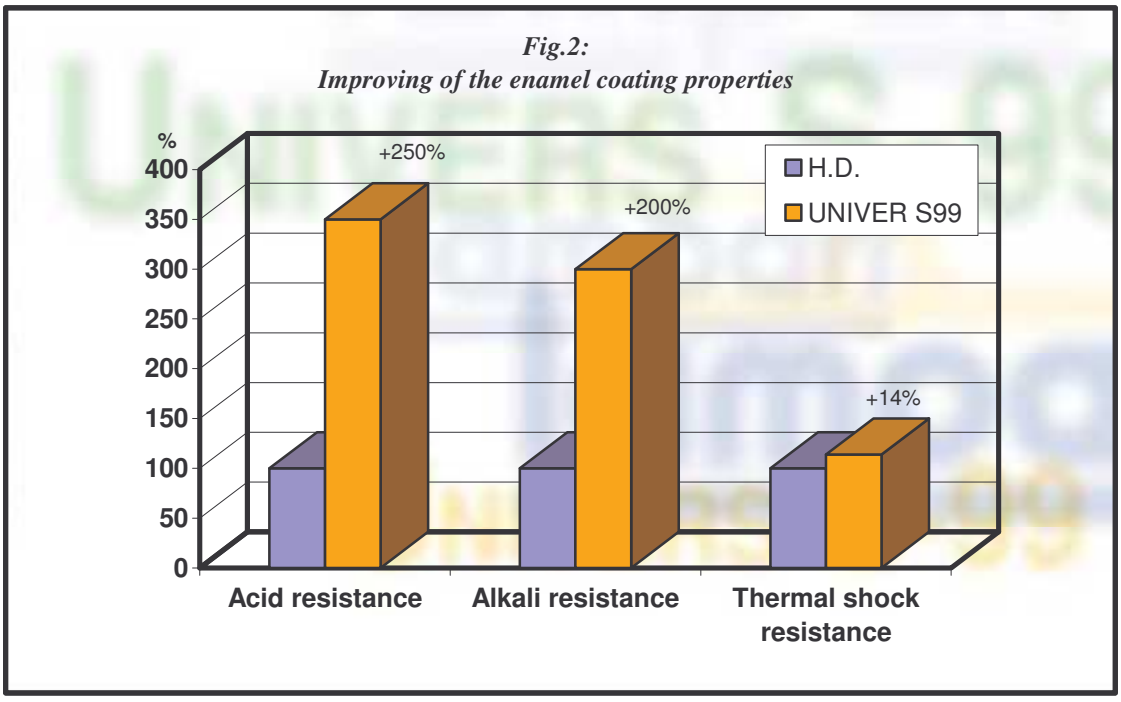


Fig.2:
Improving of the enamel coating properties

The acid resistance will improve by 250 per cent, the alkali resistance by 200 per cent, the thermal shock resistance by 14 per cent.

The life expectancy of the equipments will improve from 6 to 21 years ***(Fig.3.)***.

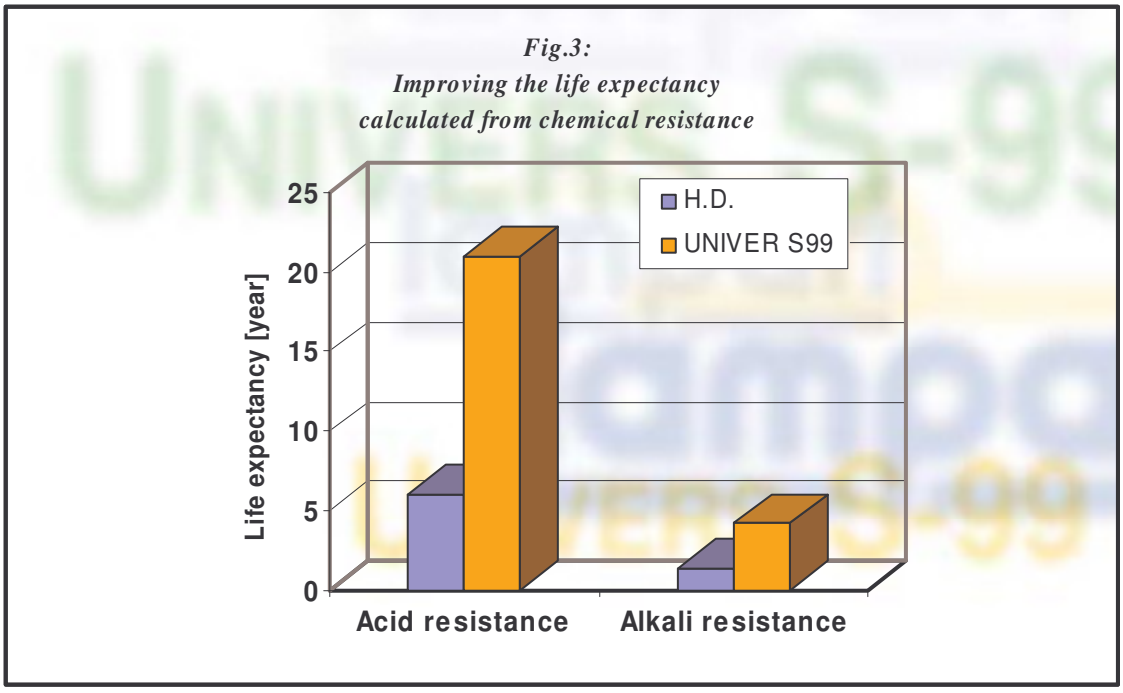


Fig.3:
Improving the life expectancy
calculated from chemical resistance

SUMMARY

It is not enough to have a suitable enamel composition to produce quality product.

The basis of Lampart know-how is the considerable experience. It involves not only the suitable composition of enamel, but also the long experiences of our technicians and engineers, the techniques needed for applying the enamel, the choice of the materials used in construction, the methods of constructing the base vessel, a knowledge of applications, the checks and controls, the technique of firing and so one. Failure to observe certain strict rules and procedures can seriously prejudice the quality, not to mention the successful application of the coating.

We are thinking in Lampart, that we has given the knowledge to Huateng Datang hands, if use it well, he could gain great market benefit in China and all over the world. We sold not equipments and machines, but the technology dandled during 40 yeas, which has testified yet, the knowledge, which is top secret in enamel coated equipments producers all over the world. Apply successfully.