Endeka Ceramics' 'Fine China' Glaze Application Recommendations

Introduction

The sample(s) of glaze accompanying this sheet is from Endeka Ceramic's ThermECO range of products, which have been designed to reduce firing temperatures and thereby energy costs, for their end users.

In order to achieve optimal performance, it is suggested that the recommendations outlined below are considered before product use. These technical recommendations are designed to serve as guidelines for customers, occasionally individual customer requirements or conditions may necessitate some deviation from these guidelines.

Recommended Use

Articles to be glazed can be prepared in the same way as with conventional 'fine china' or 'hotelware' glazes. This product has been developed and tested on a range of vitreous substrates.

1) Sample Preparation

a) For sample(s) supplied in liquid form – Generally Endeka Ceramics supplies liquid glaze samples with a level of organic glaze binder and preservative contained, which should be optimal for the customer receiving the sample. It is recommended that this glaze be set up as follows:

Slurry density (S.D.) = 1.59 – 1.63 Kgs/L
Fluidity (torsion viscometer) = 150 – 200°(17.46mm bob)

It is suggested that a diluted solution of AlCl3 offers the most compatible performance with this product for setting of the sample's rheological properties. However, other electrolytes such as diluted CaCl2 or MgSO4 may also be used.

b) For sample(s) supplied in dry form – Samples received in dry form should be reconstituted by either; high-speed mixing (for approximately 30 minutes) or ball milling (for no more than 1 hour using a porcelain-lined mill with high density alumina media) with water and a suitable cellulose-based glaze binder and preservative (generally 0.1 – 0.15% of dry glaze, dependant on desired rheology characteristics required).

Recommended glaze powder : water ratio = 100 : 50.

For best results the resultant liquid glaze should then be screened through a –0.112mm nominal aperture mesh (BS 140's mesh) and magnetted, to remove any agglomerates that result from the glaze drying process.

It is then recommended that the screened liquid glaze is set up using a high-speed mixer. The recommended fluid properties of this glaze are:

Slurry density (S.D.) = 1.59 – 1.63 Kgs/L
Fluidity (torsion viscometer) = 150 – 200°(17.46mm bob)

It is suggested that a diluted solution of AlCl3 offers the most compatible performance with this product upon setting of the sample's rheological properties. However, other electrolytes such as CaCl2 or MgSO4 may also be used.

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APPLICATION RECOMMENDATIONS

2) Sample Application

After preparing the glaze sample, as described above, the optimum performance of this product can be achieved as follows:

a) For spray application –

Best results are obtained by a dry-spray application. This can be achieved by preheating the biscuit articles, to be sprayed, to 160-200°C and spraying at airline pressures of 2.06-3.45 bar (30-50 psi). To ensure the correct weight (and thereby thickness) is achieved, the article to be glazed should be weighed then reweighed after application. It is recommended that 14-15g should be applied to the face of a 203mm (or 8") diameter circular article, whilst 75% of this weight to the back of the article. (Ensure glaze layer is fully dry before weighing). Application weight, for different sized articles, is prorata to surface area and can be calculated from the information given above on the 203mm diameter article.

Having established the appropriate application weight, the applied unfired thickness of the glaze can be measured for future Production control purposes. However, should application conditions alter, this process needs to be repeated as unfired glaze thickness is influenced by both glaze weight applied and the degree of compaction in the sprayed glaze layer. This, in turn, is dependant on process conditions.

The optimal target fired glaze thickness for this product is 150 microns or 6 thousands of an inch.

b) For dip application –

For this application method, the rheology of the glaze needs only slight further modification with water and electrolyte to achieve the following rheology:

Slurry density (S.D.) = 1.57 – 1.58 Kgs/L
Fluidity (torsion viscometer) = 140 – 160°(17.46mm bob)

If required, further improvements to this product's dipping characteristics maybe possible by additions of supplementary organic glaze hardener(s) and/or electrolytes. (Further advice is available on request.)

The optimal target fired glaze thickness for this product is 150 microns or 6 thousands of an inch.

3) Sample Firing

This ThermECO product(s) has been developed and tested, both in the laboratory and through factory-scale trials, to operate through a wide temperature range i.e. 1010°C – 1100°C (nominal green No.27 bullers ring values of 7 – 20). This product(s) will operate through both gas and electric enabled firing cycles, although optimum firing conditions for this product(s) for any individual customer will differ. This is due to the variable conditions existing from one factory to another e.g. specific kiln type, kiln dimensions, kiln loading, kiln energy source, size/shape of fired articles, characteristics of biscuit ware and internal quality requirements.

In order to establish the optimum performance for any given set of conditions, it is recommended that test samples are prepared and fired initially at a laboratory or small trial scale, over a range of different temperatures. It is also suggested initially to keep the time at peak temperature, the 'dwell', fixed (around 90 minutes) and modify the ramp and cooling rates until acceptable results are produced. A typical 8-hour firing cycle maybe:

25°C - 1060°C (200 minutes)
dwell at 1060°C (90 minutes)
1060°C – 25°C (200 minutes)

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It is possible to use this product(s) through more rapid cycles e.g. 4 hours cold-cold but it is recommended, in order to do this, that this is confined to small holloware articles and/or single deck firing (no refractory setters or cranks) because of potential thermal shock issues both of the articles and the refractories. However, even for shorter firing cycles, it is suggested that the dwell time is a minimum of 40 minutes.

Further advice is available on request regarding potential options to improve the fired appearance of articles.

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