

# Nickel Pentrate

# EU86341

Nickel Pentrate is an outstanding development in the black oxide finishing of iron and steel. It gives a very uniform, reproducible, jet black colour on most surface textures, but highly polished surfaces take on a deep, blue/black colour, ideal for tools, small arms or semi-decorative articles.

Nickel Pentrate, in comparison with conventional oxidising methods, gives faster blackening, increased corrosion protection, increased abrasion resistance, improved appearance and lower operating costs. It meets or exceeds all government or automotive specifications for black oxide coatings.

The simple-to-operate, one pack process contains special activators and complexants which speed up the oxidising process and prevent contamination from non-ferrous metals or colloidal iron precipitates.

The Nickel Pentrate solution also contains surfactants which make the solution more fluid - drag out is minimised and it does not go solid when cold.

## 1. SOLUTION COMPOSITION

Nickel Pentrate (EU 86341) 720 g/l

**Caution: Eye protection and safety clothing must be worn when making-up a Nickel Pentrate bath.**

Fill the tank half full with cold water and slowly add the correct quantity of Nickel Pentrate salts while stirring. (As the salts dissolve they generate heat, therefore, it is important that the water is not pre-heated nor heat applied until the bulk has dissolved).

When dissolution is virtually complete, add cold water to raise the level of the solution to within 10 - 15 cms of the top of the tank. Heat the solution until it comes to the boil, stirring occasionally. When the solution is at a rolling boil, record the temperature with an accurate thermometer.

If the solution boils above 141°C add water slowly and carefully to lower the concentration and boiling point. If the solution boils below 141°C add Nickel Pentrate salts (EU 86341) in small quantities to raise the concentration and boiling point. Alternatively, if the volume is high, allow water to evaporate.



## 2. OPERATING CONDITIONS

- Temperature            A new solution should be operated at 141°C. but as the solution ages, the boiling point can be allowed to rise to a maximum of 143°C.
- Time                    3 to 10 minutes until the black colour is deep and uniform.

## 3. MAINTENANCE

Solution is lost through drag-out and water is lost through evaporation. The solution should be maintained at constant volume and boiling point by the addition of Nickel Pentrate salts and water. The maintenance additions can be made at any time or in a single replenishment at the end or beginning of a working shift or day. The proper ratio between salts and water is critical and maintenance must not be neglected.

**Additions should be made when there is no work being processed.**

### **Addition of Nickel Pentrate Salts**

This is required when the boiling point is low. Salts should be added very slowly, with stirring to prevent boil over, until the boiling temperature rises to the operating level.

### **Addition of Water**

Water is required when the boiling point is high. It should be added very cautiously by slowly running it down a corner of the tank. Because of the high temperature, some sputtering may occur and a splash guard or shield may be placed to cover the corner. (If the operator is inexperienced, it is preferable to cool the bath to 100°C. before diluting it). The addition of water should continue until the boiling point is at the operating level. Do not add water below the level of the solution - an explosion could result.

## 4. OPERATING SEQUENCE

Articles should be carried in iron or mild steel baskets or racks, hung on iron hooks or wired with soft iron wire. Do not treat aluminium, cadmium, tin or zinc as this can contaminate the Nickel Pentrate. However, steel assemblies which have been copper brazed or silver soldered can successfully be blackened, the joints blending in with the black colour.

- (a) Clean articles in a hot alkaline cleaner, such as Metex PE 55. This will remove all types of oils, greases and compositions from the surface of the article.



- (b) Rinse. For most work, and prior to an acid pickle, a cold water rinse is suitable. Where massive, heavy sections are to go directly into the Nickel Pentrate solution, however, a hot water swill will serve to pre-heat the load, enabling the blackening to occur in a reasonable time.
- (c) Acid Pickle. Nickel Pentrate will not cover rust, scale or surface discoloration. Therefore, an optional acid pickle is necessary for tarnished, corroded or heat treated steel. Typically this would be Metex Skalene EU 86200, which effectively removes all rust and scale, but has no effect on clean steel.
- (d) Rinse. Cold for most work but a hot rinse is necessary for pre-heating massive articles.
- (e) Nickel Pentrate. Immerse for 1 to 10 minutes until the black colour is completely uniform. Solution should be boiling before work is immersed. Some types of work, e.g. flat articles, must be agitated frequently to ensure even blackening.
- (f) Rinse in warm (approximately 50°C) water.
- (g) Rinse thoroughly in clean, cold water.
- (h) Where articles are blackened in the assembled state, with deep pockets, blindholes or seams, there is a danger of "salt creep" - a white bloom which spoils the black finish. The same difficulty can be experienced with sintered parts. It is recommended that parts are treated through Rinsekleen Salts EU 86343, which is a neutralising solution and removes all traces of Nickel Pentrate which may remain. It has excellent penetrating characteristics.
- (i) Rinse thoroughly in clean, cold water.
- (j) Oil. Immerse in a dewatering oil, heavy oil or wax, depending on the final use of the articles and the corrosion resistance required. Metal Protective Oil, EU 86965 or Osrotect DW 6, EU 86968 are suitable.

## 5. EQUIPMENT

Tanks, fixtures, pipes, heaters and extraction hoods should be constructed from mild steel. All joints and seams should be welded. It is recommended that efficient fume extraction is fitted. Heating may be by gas burners under the tank or by steel steam coils or steel clad electric immersion heaters. Temperature control is critical and a direct reading dial type thermometer is an advantage. A volume level indicator is also recommended to avoid guess work.



## 6. SAFETY IN HANDLING AND USE

Refer to relevant Material Safety Data Sheets.

## 7. EFFLUENT

It is recommended that waste water treatment is carried out to conform to the specific requirements of the local authority. Advice on how to meet these requirements, once known, can be obtained from MacDermid plc.

### **Disclaimer**

Any information given here relating to Health & Safety should be regarded as general advice and is not to be regarded as comprehensive or definitive.

Every user should also be in possession of Safety Data Sheets for each individual product/chemical used. These are available for all products sold by MacDermid plc.

The Safety Data Sheet contains the definitive advice.

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