

**TECHNICAL SERVICE DATA SHEET****PHOSFINE - M 11**

**INTRODUCTION :** *PHOSFINE - M11* is phosphating concentrate for accelerated hot immersion process which produces complex Manganese-Iron phosphate coating on steel and zinc surfaces *Phosfine - M11* produces a non-metallic, oil absorptive, crystalline, black/dark-gray Manganese - iron phosphate coating on steel and iron surfaces to reduce wear and prevent galling of moving parts, such as bearing surfaces. This includes pistons, piston rings, shafts, gears, cylinders and all types of machine parts wherever wear is a constant factor to be considered. Coating weight obtained is 750 - 3000 mg/ sq. ft.

**FEATURES :** The manganese iron phosphate coatings obtained by *Phosfine - M11* bath are :

1. Act as a solid lubricant until the two wearing surfaces can form matched mating surfaces.
2. Act as a porous base for liquid lubricants.
3. Provide corrosion resistance of high order in conjunction with oils. It may be used as base for matt and semi-matt paint finishes.
4. Manganese - iron phosphate Coatings produced by Phosfine - M 11 meet specifications of IS: 3618 : 1966 Class A 1.

**HOW MANGANESE PHOSPHATE WORKS AS ANTI-WEAR COATING :**

When two parts, manganese phosphated to reduce friction by providing lubricity, are put into service in contact with each other, the phosphate coating is smeared between the parts, thus acting as a buffer to prevent wear of moving parts or welding of heavily loaded gears. The phosphate coating need not stand up for an extended length of time, because it is in the initial movements, that parts can be damaged and require lubricity. e.g. Scoring or gears usually takes place in the first few revolutions, during this time, phosphate coating prevents intimate contact of the faces. As the coating is broken down in the operation, some of it is packed into pits or small cavities formed in the mating surfaces by the etching action during phosphating. Long after break-in, this material packed into the pits prevents direct contact of mating surfaces. In addition, it faces as reservoir for oil, assuring continuing lubrication. As work hardening of the gear surfaces takes place, the coating and the etched area may disappear completely, but by this time scoring is unlikely to occur.

**BATH MAKEUP AND PHOSPHATING PROCESS :**

Clean the tank thoroughly before making up the solution. Be sure all grease, rust and scale is removed prior to making the phosphating solution.

1. Fill up the tank to half of its capacity with cold water
2. Add 6 litres of *Phosfine - M 11* per 100 litres of bath solution
3. Make up to its operating level with tap water and mix it well by stirring.
4. Heat the bath to 65 - 70°C ; carry out aging by introducing 50 - 100 gms of cleaned steel wool per 100 litres of bath solution for 30 - 50 minutes . Remove the steel wool.
5. Heat the bath to its operating temperature 90°C - 99°C.
6. Immerse the steel components. Generally, when gas evolution is ceased, indicating the completion of coating formation, the jobs can be removed from the bath. Process time 10 min to 30min.

**NOTE :**

1. Temperature of the bath should be maintained as specified (i.e. 90 - 99°C or almost boiling temperature).
2. Strength or pointage of *Phosfine - M 11* bath should be maintained within a narrow range, preferably between 40 - 45 points to ensure stability of bath
3. Tank should be desludged periodically. After cleaning, and making up the volume with water, pointage should be raised upto 40, by the addition of *Phosfine - M 11*.
4. Tank level should be maintained to the desired level by adding water to compensate evaporation losses.

**OPERATING PARAMETERS :**

Concentration of <i>Phosfine - M 11</i> :	5 - 7 % v/v
Pointage or strength of the bath :	40-45
Ferrous ion Concentration :	0.5% max
Operating Temperature :	90 - 99° C
Immersion Time :	10 - 30 minutes

**PROCESS CYCLE :**

The components that are to be phosphatised must be free of oil, grease, rust scale etc. The type of process cycle depends upon the amount of oil scales etc. present on the components. In case of Manganese Phosphating rust and scale are preferably removed by shot blasting. Acid pickling before manganese phosphating yields coarse grained coating and requires longer immersion time for phosphating; and some times needs a dip in 'activator and grain refiner' Phosfine MA and Phosfine - MB in hot water to get a satisfactory and consistent coating. Solvent treatment prior to phosphating gives excellent, adherent and dense coating

1. *Degreasing*: The best method is to clean with Trichloroethylene vapour. This process is recommenced where by heavy oils and grease are present on the work and where a smoother finish is desirable. Heavy Duty Alkaline cleaners such as Alkaline Degreaser RD - 1 can be used if coarse coating with more oil retaining feature are desirable
2. *Rinsing* : A clean continuously overflowing tap water rinse should be used.
3. *Rinsing (and activating)* : A boiling water dip with or without 'activator and grain refiner' just prior to the phosphating dip, can serve to pre-heat the parts thus accelerate the coating formation producing finer and more uniform coating. (The activating dip is preferable if alkaline or acidic dip are incorporated prior to this step, but it may be skipped if acceptable coating is obtained without this step.).
4. *Phosphating*: As described in "BATH MAKEUP AND PHOSPHATING PROCESS"
5. *Rinsing* : A clean continuously overflowing tap water rinse should be used.
6. Passivating rinse in hot water containing *Passivex - A*
7. *Drying* : Hot air blowing to dry free of moisture.

After drying Manganese phosphate coating should be sealed as soon as possible by or by organic finishes such as rust preventive oils, stains or lacquer etc.

**DERUSTING OR DESCALING :** If shot blasting is not possible derusting may be done by derusting in *Rustban-77* or *Rustban - 111* bath. This derusting stage should be after the stage 2 followed by an overflowing tap water rinse before stage 3. But any acidic derusting may result in coarse grained coatings.

**TIMINGS OF PROCESS CYCLE :**

1. Degreasing	.....	5 - 10 minutes
2. Rinsing	.....	15 - 30 seconds
3. Boiling water dip with or with out activator (optional)		1 - 2 minutes
4. Phosphating	.....	10 - 30 minutes
5. Rinsing	.....	15 - 30 seconds
6. Passivating	.....	1 - 3 minutes
7. Drying & sealing with oil		

**CONTROL AND MAINTANANCE:**

For optimum results and maximum bath life, *Phosfine - M 11* solution should be maintained on the basis of regular analysis using the analytical procedures given as under

*PHOSFINE - M 11 CONCENTRATION :*

Pipette out 10 cc of the bath solution, add 5 drops of Phenolphthalein indicator shake well titrate against 0.1N sodium hydroxide, till colour changes to permanent pink. The number of ccs of 0.1N sodium hydroxide corresponds to "Total Acid Pointage". For each point below 40, add "160 cc" of *Phosfine - M 11* per 100 litres bath.

*FERROUS IRON CONCENTRATION :*

*Normally, the ferrous ions in the bath is fairly stable and gets maintained within 0.2-0.4%. But during long usage, the concentration gradually builds up and when it reaches about 0.5%, resulting in patchy or dusty coatings, the bath needs to be discarded and a fresh bath is to be prepared.*

Pipette out 10 cc of bath solution into a conical flask, as 1-2 cc of 50% H<sub>2</sub>SO<sub>4</sub> to it. Titrate against 0.1N Potassium permanganate till colour changes from colorless to pink, persisting for at least 15 seconds.

Volume of of 0.1N Potassium permanganate consumed in ml x 0.056 = Percentage of Ferrous. When Ferrous concentration reaches 0.4% (i.e. 0.1N Potassium permanganate reading = 8 cc) bath should be discarded and a fresh bath is prepared

*SLUDGE :*

During the operation of *Phosfine - M 11*, sludge, a natural by product of the chemical reaction, is formed slowly. This sludge will settle to the bottom of the tank and should not be stirred up while parts are being processed; otherwise dusty coatings may result. The solution should be desludged periodically preferably once or twice a week depending on the work load and accumulation of sludge.

**EQUIPMENT :**

Selection of equipment such as material of construction of tanks, size of tanks type of heating and handling devices depends on the production rate, type of components, kind of finish needed and various other factors. Contact us for any guidance required.

**HANDLING AND SAFETY PRECAUTIONS :**

*Phosfine - M 11* is mildly acidic and oxidizing in nature. Normal safety precautions such as rubber gloves an aprons as well as safety glasses should be worn when handling this chemical. In case of contact with skin, flush with plenty of cold water, for eyes flush with clod water and obtain medical attention.