

METHODS OF BATCH TREATMENT

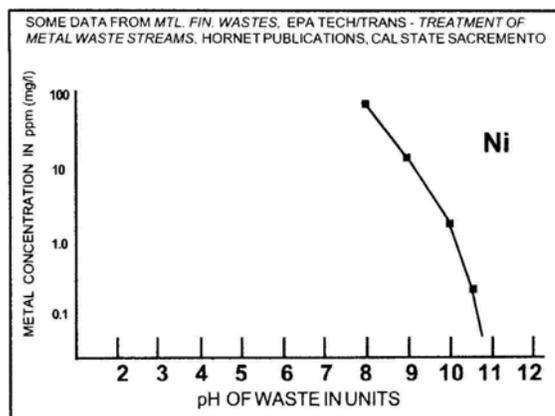
NICKEL METAL

TYPICAL SOURCES:

Nickel metal in either dissolved or suspended state is present in many processes. Electroplating, electropolishing of stainless steel, electroforming, metal pickling, metal stripping, etching and passivation. Other processes where nickel may be found are metal ceramic alloy machining. Mechanical deburring, nickel acetate sealing, nickel activation, striking and electroless nickel plating.

ASSUMPTIONS & NOTES:

We will assume the nickel metal is in solution and not suspended. If particulate metals are present is advised to filter and remove them prior to treatment. It is also assumed that the nickel is not complexed either as an electroless bath or a cyanide complex. Electroless nickel is dealt with in another report. Waste is expected to be relatively free of oils and grease.



METHODS & PROCEDURES

The first step in the treatment of any waste stream is to document and know the waste stream constituents. Perform an analysis of the stream to determine the metal concentration. All safety precautions stated in chemical supplier's MSDS documents must be enforced. Maintaining a log of each batch is also important in being able to repeat the treatment method

After metal concentration levels have been established, perform a jar test using either magnesium hydroxide, lime, aluminum, caustic soda or DTC to precipitate out the nickel. There are other methods of metal precipitation using sulfides such as sodium sulfide or ferric chloride, but these are used infrequently because of problems of toxic gas production and high volumes of sludge production. Remember that oils, soaps and grease can prevent or interfere with metal precipitation so remove them first if needed.

Refer to the pH chart and note that the optimum level at which nickel precipitates is approximately pH 10.5. During jar testing use the different reagents listed in order to achieve the lowest metal content and minimize sludge production. Reagents such as magnesium hydroxide and DTC can significantly reduce sludge volumes and costs of disposal. Check with suppliers for dosages. It is sometimes helpful to refrain from using any polymer until the test determines a need. Most nickel solutions will precipitate well in batch treatment without the use of polymers. Polymers are necessary in most continuous flow systems, or when rapid treatment is needed. After jar test is complete, filter out the clear water and send to lab for verification of treatment. Upon completion of jar testing begin full scale treatment.

In batch treating nickel waste streams, it is common to have very acidic solutions from plating or stripping operations. Many times concentrated sulfuric acid is used or other strong acids which can evolve heat during the pH adjustment phase. If using caustic soda or lime, add reagents slowly. If possible, outfit the treatment tank with a cooling system to prevent accidents. Another option to prevent heating, (exotherm), is to use a reagent chemical such as magnesium hydroxide that will not create exotherm.

When treating full scale batches remember that constant and adequate mixing is a must. Using an automatic pH controller which targets a specific pH level and turns on or off the reagent pump keeps the operator away from the batch chemistry.

The tank used should be a conical bottom tank constructed of thermoplastic, approved fiberglass or a properly lined steel or stainless tank. Where different waste streams are present, the operator should call a professional to specify the best liner and materials of construction.

- Step 1. Confirm optimum pH in jar test. (approx 10.5)
- Step 2. Bring pH to optimum level while mixing to precipitate.
- Step 3. Add polymer as needed to develop floc. (slow mixing).
- Step 4. Let settle and begin to filter press.
- Step 5. Test filtered water before disposal.

IMPORTANT; The above information is supplied as a general information guide only. In developing the Methods of Treatment Series, IPEC has obtained the above data from various sources. Industrial standards, vendors, government publications and experience in the field. No guarantee of effectiveness is implied or accepted by IPEC. Each user has a unique waste stream and is totally responsible for the outcome. Prudent methods of batch treatment requires proper safety measures & training are in force and the user has performed jar testing for effectiveness and safety..