What is an asphalt emulsion? An asphalt emulsion consists of three basic ingredients: asphalt, water and an emulsifying agent. In some instances the use of a stabilizer is needed.

In making an asphalt emulsion the object is to disperse the asphalt into water and create an emulsion that is stable enough to be pumped, stored in tanks and mixed in the field.

The asphalt emulsion should break quickly after contact with the aggregates in the mixer or after being sprayed on road bed. When the asphalt emulsion is cured the residual asphalt retains all the characteristics of the asphalt from which it was produced, i.e. adhesion, durability and water resistance.

How is it made? Asphalt emulsions are manufactured using a high speed, high shear mechanical device, usually a colloid mill, that divides the asphalt into tiny droplets. The colloid mill has a high speed rotor that revolves at 1,000 – 6,000 RPM with mill clearance settings in the range of 0.25 to 0.50 MM or 0.01 to 0.02 INCH. These settings produce an asphalt emulsion with droplet sizes smaller than the diameter of a human hair.

Types of asphalt emulsions, the chemical that is emulsifying agent determines whether the asphalt emulsion will be anionic (negatively charged) cationic (positively charged) or nonionic (neutral).

The type of emulsion that is used in recycling is determined through tests of the aggregates to be used. The grades of asphalt emulsions are classified as rapid set, slow set and medium set. The term "set" employs when the asphalt emulsion will cure. Slow set and medium set emulsions have been used extensively in cold recycling.

Conception of use of emulsions in cold recycling, the amount of bituminous material in the material to be cold recycled will determine which asphalt emulsion type will be best suited for the project. There are two schools of thought in recycling. One extreme is to treat the bituminous mix content as black rock and use the asphalt emulsion as a binder to hold the black rock particles together. The other extreme is to rejuvenate or soften the asphalt that is present in the mix and bring it close to new material specifications. A recycled asphalt pavement that may have 100% R.A.P. can be effectively recycled using an emulsified rejuvenator or at medium set emulsion that contains some solvent.

A slow set asphalt emulsion is used when there is some life left in the asphalt in the R.A.P., but the mix is less than 50% R.A.P. A slow set is also used when the mix is a dense graded mix. A medium set is used when the mix is more open graded.

Tests for design using emulsion in cold recycling, at this time there is no universally accepted design procedure for cold recycling or cold in place recycling. The Asphalt Emulsion Manuf actures Association and the Asphalt Reclaiming and Recycling Association, are both doing research on mix designs.

A procedure to determine what emulsion to be used in cold recycling must begin with samples taken in the field; analyzed in the laboratory; such as extraction, gradation, abson recovery. An optimum moisture content is determined. Sample plugs are made at various asphalt emulsion content and cured and broken to determine strength/stability. This design is then used as a guide for field work. A mix design will detail the water/moisture content necessary; the optimum amount of asphalt emulsion, the type and grade of asphalt emulsion. The number of days the mix has gained enough strength and when it can be capped.

Follow up of the field work is very important. Samples must be taken and evaluated in the laboratory to see if the emulsion is performing as designed. Is the emulsion being dispersed on the aggregate? Is the
emulsion coating the aggregate? Are there any signs of stripping of asphalt or rejection of the asphalt by aggregate? It is important to make plugs of field sample and compare results with design. Cold recycled pavement should be cored after a period of time for further checks. The road should be proof rolled to determine if there are any soft spots. These should be corrected by surfacing.