SOLDERING

Soldering is the process of joining two pieces of bare metal together. Solder is a mixture of lead and tin (60/40 Rosin Core Solder). During the process of soldering **Heat Sinks** are often used to dissipate heat**.** Alligator clips (Crocodile clips) or needle nose pliers are commonly used as Heat sinks. Continue on page 157.

What is the purpose of Tinning? Tinning is the coating or the filling of wires or connector contacts with solder. Before soldering two parts together, they should first be tinned. The purpose of tinning is to form a proper thermal linkage. This thermal linkage must be present in the contact between the soldering iron tip and the components. By having a small amount of solder at the point of contact, helps to transfer heat faster and more efficiently, improves the thermal linkage.

Solder wick is a mesh of copper wire used to remover solder from a soldered joint. Solder wick is placed between the Soldered joint and the soldering iron. When the soldering iron heats solder wick, it melts also the solder and drawing it in (soak up).

Solder Suckers are spring loaded or have a suction bulb to which to suck the melted solder out of the joint. Solder Suckers come in two ways, with heat built in or only the suction ability. When the solder sucker only has the suction ability, a soldering iron is used to melt the solder.

Disadvantage of using rosin core solder, doesn't clean efficiently, there can be residue, and there are health issues. Heated metals tend to oxidize rapidly. This is the reason the oxides, scale, and dirt must be removed by chemical or mechanical means. Grease or oil films can be removed with a suitable solvent. Rosin-core solder will prevent oxidize during soldering. The disadvantage is it doesn't clean efficiently and there can be residue. The rosin in the solder can clean the surface, but not completely remove the dirt from the soldering process when there is excess contamination on the parts leads to. During soldering exposure can occur as evaporating solvent, which may contain droplets of rosin and or other organic decomposition products. Droplets can enter the body though the eyes, lungs, or mouth. Inhalation of flux fumes during soldering may cause irritation and damage of mucous membranes and respiratory system. Local irritation by can occur in the area of contact with flux or fumes

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SANDPAPER

Grit size refers to the size of the particles of abrading materials embedded in the sandpaper. Particles size are typically expressed in microns, the old term for the micrometer. These standards establish not only the average grit size, but also the allowable variation from the average. The two most common are the United States CAMI (Coated Abrasive Manufacturers Institute, now part of the Unified Abrasives Manufacturers' Association) and the European FEPA (Federation of European Producers of Abrasives) "P" grade. The FEPA system is the same as the ISO 6344 standard. Other systems used in sandpaper include the Japan Industrial Standards Committee (JIS), the micron grade (generally used for very fine grits). The "ought" system was used in the past in the United States. Also, cheaper sandpapers sometimes are sold with nomenclature such as "Coarse", "Medium" and "Fine", but it is not clear what standards these names refer to.

BELT CLAMPS are used to clamp ends of belts together. A conveyor belt clamp is made up of a pair of parallel plates which hold a belt between them. The clamps are normally hammered into the belt.

Motor vibration is most likely due to a loose motor mount or coupling can cause vibration. Any object that is rotating at high RPM will vibrate when unbalanced. A loose coupling will become missed aligned and unbalanced. A loose motor mount contributes to miss alignment and fluctuation in the output shaft especially to motors under various load conditions, causing vibration.

Solenoid's converts electrical power into linear motion. Solenoids, consist of a movable steel or iron_slug (called an armature) in the center of a coil of wire. The coil is shaped such that the armature can be moved in and out of the center creating linear motion. The armature is used to provide a mechanical force to some mechanism sliding electric locks. The force applied to the armature will always move the armature in a direction that increases the coil's inductance.

TAPS

A tap cuts threads on the inside surface of a hole, creating a female surface which functions like a nut. The three types of taps listed below:

Bottoming Taps has a continuous cutting edge with no taper which allows it to cut threads to the bottom of a blind hole. A bottoming tap lack the taper required to successfully start an unthreaded hole.

Plug Taps has tapered cutting edges, which assist in aligning and starting the tap into an untapped hole. There are the most commonly used taps.

Taper Taps are similar to plug taps, but has a more pronounced tapering to the cutting edges. This feature allows gradual cutting action that is less aggressive than that of the plug tap.

SCREW SIZE

If the label states 1/4"-20 that means the screw or bolt diameter is ¼ of an inches and it has 20 treads per inch. The first number giving the diameter in inches and the second number being *threads per inch*. **Machine screws** are described as 0-80, 2-56, 3-48, 4-40, 5-40, 6-32, 8-32, 10-32, 10-24, etc. up to size 12. The first number can be translated to a diameter, the second is the number of threads per inch. These screws comes in both coarse thread and a fine thread for each size, the fine thread being preferred in thin materials or when slightly greater strength is desired. **Metric screws** are designated by the letter **M** followed by the diameter of the thread in millimeters, e.g. "M6". Normal coarse pitch is 1.25 mm in the case of M8. When a metric screw does not have the normal coarse pitch it is stated on the label in millimeters and is also appended with a multiplication sign, like this M6×1. A screw which states M6x1 (size screw, the diameter & threads advances in mm per rotation) on it label would have a 6mm diameter and advances by 1 mm per 360˚ rotation."

GEAR OIL

Many modern gearboxes use a 75W90 gear oil, (for SAE 90). When used in a gearbox the lubricant provides two primary benefits: lubricate the teeth and remove heat generated from the gear operation. The lubricant also often lubricating the various bearing found in the gearbox. Synthetic

gear lubricants can also contain rust and corrosion inhibitors, EP additives, demulsifiers, antifoam agents and in some cases solid lubricants. They can be supplied in grades which corresponds to ISO viscosity grades 32 to 6,800. synthetic gear lubricants over used at temperature ranges of -46^{o} up to 125^{o}C. Compounded gear oils are limited to an upper operating temperature limit of 82^{o}C. The oils are supplied in grades corresponding to ISO viscosity grades 460 to 1,000. Worm drives are inefficient because the gears experience sliding rather than rolling contacts, leading to operating temperatures much higher than other gear types. Spur gears normally operate at 28˚C higher than ambient temperatures while worm gear temperatures typically rise 50˚C over ambient. This temperature difference is required to aid in dispersing the friction heat generated.

Due to the sideway sliding motion in worm gears, it is difficult to maintain a hydrodynamic oil wedge. This results in gears operating under boundary lubrication conditions. Also, high operating temperatures that approach 88˚C and higher usually require oils with an ISO VG of 460 and higher. They also require good thermal and oxidative stability. The types of oils used to lubricate worm gears are compounded mineral oils, EP mineral gear oils and synthetics. The types of oils most commonly used to lubricate worm gears are compounded mineral oils, EP mineral gear oils and synthetics. Viscosity is the most important physical property of a lubricating oil. Because the viscosity changes with temperature, the rate of change is an important property identified by the Viscosity Index (VI). Most mineral-based gear oils will have a VI of 95. A lower VI indicates that the oil's viscosity changes to a greater extent with change in temperature. Conversely, a higher viscosity index indicates a much lower rate of change in viscosity with respect to change in temperatures. The advantage of a high VI is that in lower temperatures, the oil will tend not to increase viscosity as much as a lower VI product. The ability of an oil to maintain a small viscosity differential over the operating range of the gearbox provides a more consistent lubricating film to the gears and more predictable wear performance.

DRILLING

In the process of drilling drill at low speed for large bits and high speed for small bit drilling steel. Use the size of the bit to drill the size of the hole. An example, use a 1/8 bit to drill a 1/8 hole. Always wear eye protection - Don't apply too much pressure on small drill bits - Ease up on pressure when drill breaks through material - The larger the drill bit the slower the speed of the drill - Use a vise or clamp to hold the material to prevent it from spinning if the drill bit catches - To prevent wood splintering when the bit exits clamp a piece of scrap material to the back of it - If possible stop drilling just as the point of the bit comes through the material, then finish drilling the hole from the other side - When drilling a large hole in metal a small lead hole helps to relieve the feed pressure required.

Drilling straight holes [1] Put of safety glasses or goggles. [2] Secure the working media with clamps or vise. [3] Center punch the working media where the hole is to be drilled. [4] Position yourself so steady pressure maintained and keeping a good line of sight. [5] Place the bit against the center marking, start drilling slowly, speeding up after the bit has penetrated. [6] When drilling metal add coolant to the bit as drilling is take place or stop to dip the bit into coolant every 30 seconds.