



The Making of a Pencil Crayon

Compounding & Formulating

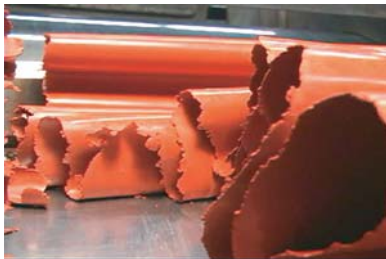


Formula sheet is printed from the master formula file for the style and colour needed. All raw material ingredients, which include pigments, waxes, lubricants and binders, needed for one mix are carefully weighed by the Compounding Technician and assembled together on one pallet. A batch lot ticket is then attached to this pallet before it is moved into the Mixing Dept.

Mixing & Rolling



Dry ingredients are emptied into a large "sigma blade" mixer and mixed dry for 10 minutes. While dry mixing is taking place the waxes are melted in a heated kettle. When the waxes have been melted they are then added, along with water, to the dry materials in the sigma blade mixer.



After all the ingredients have been added to the mixer the material becomes a "dough-like" mass. It will continue to mix and dehydrate until the water content of the batch has reached a level of 12% to 14%. This will take somewhere between 4 to 6 hours depending on colour.

At that time the batch is removed from the mixer and passed through a two-roll mill, which transforms the material into thin sheets that are ready to move to the extrusion press.

Pressing

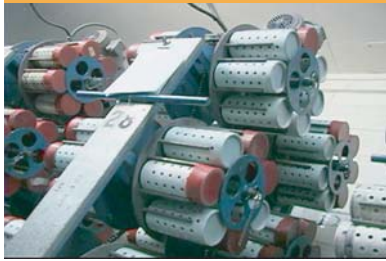


This process entails loading the mixed and roll-milled batch material into the hopper of the extrusion press. The extrusion press has a large piston ram that forces the core material through a round ceramic die that is sized to the correct diameter needed for use in pencils.

This transforms the sheeted material into a continuous length rod of core, which looks exactly like spaghetti. As the "spaghetti" like core exits the extrusion press die, it moves across a cylindrical cutting wheel that trims the cores to the correct length. The cores fall out of the cutting wheel on a moving transfer belt and are loaded into drying containers that hold approximately 800 pieces of core each.

The Making of a Pencil Crayon cont'd...

Drying Cores

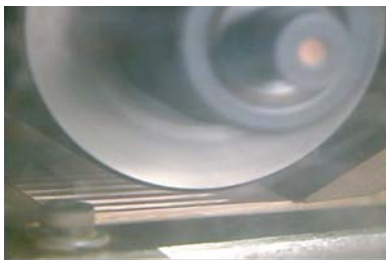
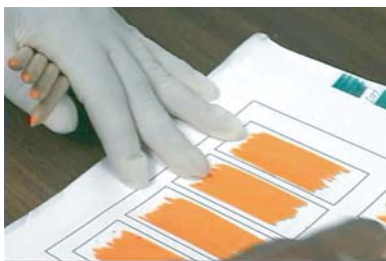


The drying containers are placed on a moveable cart that is equipped with multiple motorized drying wheels. The purposes of the drying wheels are to keep the drying containers in constant rotation while the cores are drying.

The rotational movement keeps the cores straight and will not let them crook as they are drying. After each moveable drying cart is filled with drying containers it is moved into a climate controlled drying room. Because colouring cores have a moderate amount of wax in them the temperature in the drying room is maintained at 22 degrees C.

The carts will stay in the drying room until the water content of the cores is less than 0.5%. The drying process normally takes 3 to 4 days.

Quality Control



After the cores are dry they are removed from the drying containers and placed in wooden boxes. The wooden boxes are then moved into a Quality Control holding area for final inspection.

A Quality Technician will pull random samples from each batch lot of core using statistical methods. The samples will be checked for diameter consistency, colour match to master standard and break strength.

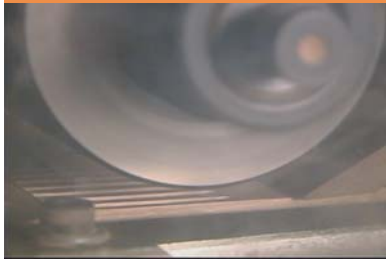
All of the test information for each batch lot is recorded in an electronic database that is available at any time for quality tracking purposes.

If the samples meet all of the quality requirements the batch lot ticket is stamped "QC Approved" and the cores are packed in corrugated cartons.

The cartons are labeled with the proper item number, style, and colour identification, then transferred into a warehouse until ready for use in wood-cased colouring pencils.

The Making of a Pencil Crayon cont'd...

The Pencil Sandwich



Pencils are made by “sandwiching” cores between two pieces of wood. This process starts with wood slats that are approximately 184mm long, 70mm wide and 4.8mm thick.

The wood slats are run through a machine that cuts a series of half-round grooves along the length of the slat on one side. The standard number of grooves cut into each wood slat for round colouring pencils is nine.

The depth of the groove is equal to half of the diameter of the core.

After the wood has had the grooves cut they are fed into a machine that places glue across the face of the slats and inside each groove.

After the gluing station one of the wood slats passes under a revolving wheel filled with core that has been fed in by a vibrating hopper. The wheel is precisely machined so that the nine cores line up exactly with the nine grooves in the slat.

After the wood slat with the glued cores pass from under the core-filling wheel another slat that has identical grooves is placed on top making the “pencil sandwich”.

Multiple sandwiches are then placed in a clamping press under hydraulic pressure until the glue has dried.

It takes approximately one hour for the glue to dry at which point the sandwiches are ready for additional machining.



The Making of a Pencil Crayon cont'd...



Shaping is the process where high-speed machines cut the sandwich into individual pencils. For this operation the sandwiches are fed into a machine that is called a “shaper”. Cutting knives that match one-half of the pencil shape profile are mounted on motorized spindles that turn at an extremely high RPM. Each cutting knife will cut all nine pencils from the sandwich in one pass through the machine.

The shaping machine has a top spindle and a bottom spindle with cutting knives in each. As the wood sandwich passes under the top spindle the nine pencils are shaped in a half-round configuration. As the sandwich passes over the top of the bottom spindle the other side of the sandwich is cut in a half-round configuration and the individual round pencils fall onto a belt that carries them to the painting machines.

Painting pencils is done on a specially designed painting machine that utilizes a thick fast drying high luster lacquer.

The lacquer is poured into a “paint pot” that has six holes that have been fitted with rubber gaskets sized for an individual pencil to slide through.

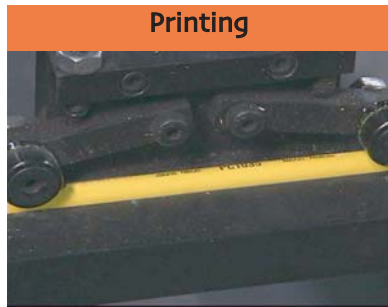
The pot is filled with lacquer and the pencils are mechanically pushed end-to-end through the paint point and fall onto a conveyor belt that takes them to the next paint pot station.

There is a continuous flow of pencils from one paint pot station to the next.

It takes approximately 45 seconds for the lacquer to dry on the conveyor belt before the pencils are ready for the next paint station.

Depending on lacquer colour 3 to 5 coats of lacquer are applied to each pencil.

The Making of a Pencil Crayon cont'd...



After the pencils are painted they move by conveyor to the imprinting machine. The imprint machine utilizes a steel die that has been engraved with the proper graphics for the particular style and colour needed. The die is mounted in a heated holder and maintained at approximately 150 degrees C. A heat induced transfer foil is routed over the heated die with the ability to index with each machine stroke.



An individual pencil will pass under the heated holder and hesitate for milliseconds while the foil is pressed between the pencil body and the imprint die.

The graphics are transferred through the foil and onto the body of the pencil. After this operation the pencils will be placed in corrugated cartons and properly identified before being moved to a storage warehouse until needed for packaging.



Most student grade colouring pencils are packaged in boxed sets that consist of 12, 24, 36 and 60 colour assortments. Special packaging machines that have multiple feed hoppers for each individual pencil colour are used to automatically box the pencil sets. The packaging machines will automatically erect a folding box and insert the proper number of assorted pencils inside.

It will glue the bottom of the box to prevent the pencils from falling out while hanging in the store. It will fold the top of the box tucking the flap in and fall onto a conveyor belt where it can then be placed in an intermediate fiberboard box.



The fiberboard boxes are then placed inside a corrugated shipping carton that has been properly marked and bar coded for shipping to our customers.