Glossary of Terms for Black Bros. Coating, Laminating, and Finishing Equipment

Roll Coating Equipment – Roll Coating is a means of applying an accurately controlled film of a liquid to various flat substrates, or to the top surface only of various embossed products. This includes adhesive or "glue" for laminating purposes as well as a variety of liquid coatings where application rate is important for performance or economic reasons.

DRC – Direct Roll Coater, applies liquid adhesive or coating from a roller to a substrate with the roll going in the SAME DIRECTION as the substrate, usually in sheet form. A Glue Spreader is a DRC with grooved applicator rolls for adhesive application.

DDRC – Differential Direct Roll Coater, similar to a DRC, but uses a variable speed Doctor or Metering roll to apply a smoother, more controllable film thickness to the stock. May utilize a finely grooved applicator roll to apply a specific amount of coating.

PRC – Precision Roll Coater, this also is similar to a DRC, but it uses an engraved Doctor roll to more uniformly control the amount of material applied.

RRC – Reverse Roll Coater, applies liquid adhesive or coating from a roller to a substrate with the roll going in the OPPOSITE DIRECTION as the substrate – can be used for certain types of sheet materials, but generally used for material in continuous web form.

RRFM – Reverse Roll Filling Machine, used to apply a heavy bodied liquid material to substrate in sheet form to fill minor surface irregularities to prepare for later finishing or laminating operations. Applies the coating as a DRC, but also has a Reverse Wiping Roll to smooth material into the surface of the stock while removing any excess.

Coil or Web Coater – This may be only a two roll head, to coat one surface of material in web form, or may incorporate two sets of rolls to coat both top and bottom surfaces of the web. Usually web tension maintains the contact between the coating roll and the stock. These are generally Reverse Roll Coaters, but a Direct Roll Coating approach may also be used.

Panel Cleaner – This is used for wood products in sheet form. It consists of one or more counter-rotating brushes to remove dust or chips from the surface of the stock, along with a vacuum pickup arrangement to assure a clean surface for gluing or coating.

Hot Melt Adhesive Spreader – This is used to apply a heated product, usually an adhesive, by using heated rolls to keep the material in a molten state during application. Some type of heating system is also supplied as part of this unit.

Laminating Equipment – Various Platen and Roll Type laminating equipment is in this category.

Air Pod Press – A low to moderate pressure (10 to 80 psi) press, widely used for laminating HPL to Particleboard, Hollow Core Doors, and different foam or corrugated materials. Pressure is applied by inflating air "pods". Spacing of air pods across the platen area determines the pressure applied.

Heated Platen Press, Air Pod – A type of air pod press using heated platens to hasten the cure of the glue line when laminating sheet materials. Platen pressures are usually from 50 to 80 psi.

Heated Platen Press, Hydraulic – A press that uses heated platens to cure the glue. Pressure is applied through the use of hydraulic cylinders. Applies low to moderate pressure or can be designed to exert 100 psi or more across the entire platen. Offers longer platen stroke than an Air Press.

Rotary Press – Also called "nip" or "squeegee" rolls, commonly used for laminating an overlay in roll form to substrate, (usually in sheet form). Pressure is applied thru air cylinders, which "load" the top roll. The rolls are usually rubber covered, but in some cases may be metal, either chrome

plated or covered with Teflon tape. The rolls may be either room temperature, or heated, depending on the specific application and adhesive used in the laminating operation.

Panel Express – A system that bonds products such as HPL to Particleboard in a continuous operation by using a combination of heat and pressure rolls. This is very effective for producing flat panels of differing lengths, as opposed to using a platen press.

Laminate Indexing Station – This device allows laying up sheets of laminate to substrate with a minimum of manual labor. A transfer mechanism brings the sheets of laminate over the glued stock so they can be handled quite easily. A stack is formed which can then be placed in a platen press. A different version of this is available for use with the Panel Express system for lay-up of individual panels.

Gluing and Coating terms:

#/MSGL – a term used to express glue spread in pounds per 1000 sq.ft. of glue line. Commonly used in the woodworking and furniture industry. Determined by weighing (in grams) the amount applied to a one sq.ft. piece of stock and multiplying by 2.2, i.e. 10 grams per sq.ft. x 2.2 = 22 #/MSGL.

Mils – a term indicating the wet film thickness of the material applied. One mil is 1/1000 of an inch. While generally used for measuring paint films, can also be a quick way to check glue spread. With an adhesive weighing 9 pounds per gallon, one mil is equal to about 5.6 MSGL. (MSGL/5.6 = mils)

Adhesion – The bonding together of two or more layers using some type of glue, or adhesive. This relies on both chemical and physical bonding between the pieces being laminated. Also refers to the bonding of a paint film to the surface being coated.

Water Base Adhesive or Coating – Any liquid product where solids are either dissolved in water or carried as an emulsion. These products can generally be cleaned from equipment with water.

Solvent – A liquid that can dissolve another substance.

Solvent Coatings – A coating or adhesive wherein the solids are dissolved as a solution, as opposed to an emulsion. Require cleaning equipment with a solvent.

PVA Adhesive – An emulsion adhesive of Polyvinyl Acetate, known as “white glue”. There are many versions of this type of product to meet a wide variety of end use requirements.

EVA Adhesive – An ethylene vinyl acetate copolymer, often a “Hot Melt”. Provides quick bonds, but lacks high temperature resistance.

MCU – Moisture Cured Urethane, an adhesive, but the term is also applied to coatings, where moisture, either in the materials being bonded or in the air, acts as a catalyst to cause cross-linking.

PUR – Polyurethane Reactive, a type of polyurethane adhesive that is applied at an elevated temperature, acts as a hot melt, then cures through the action of moisture in the materials being bonded.

Hot Melt Adhesive – This adhesive needs to be heated and applied in molten form. Cooling then solidifies the adhesive and effects the bond. Some hot melts are moisture curing, which means they further cure with the moisture in the materials being bonded.

Cross Linking – An adhesive that cures chemically to form a bond that is resistant to heat and moisture.

Thermoplastic – An adhesive that, while solid at room temperature, will soften with the application of heat. Can still have many uses, as temp required to soften will vary with specific adhesive.

Thermosetting – A type of adhesive that “cross links” to form a permanent bond. Usually comprised of a resin and a catalyst, or “setting agent”.

Catalyst – An agent that causes a chemical reaction to occur. Catalysts can be used in both adhesives and coatings to aid in cross linking the product, giving better end use performance.

Viscosity – An indication of the thickness or consistency of material – resistance to flow – water is low viscosity, molasses is high viscosity.

Viscosity Cup – A small cup used to measure viscosity by timing how long it takes for the material to flow from a certain size opening.

Brookfield Viscosimeter – A means of measuring viscosity by the resistance to flow (or shear) between a moving and a stationary object, i.e. a paddle or a cylinder in a cup.

Flow Out – The ability of a paint film to smooth out after application.

Orange Peel – A rough paint surface, similar to the peel of an orange.

Silicone Coatings – A liquid solution or dispersion of silicone applied to a surface to change the surface characteristics. Widely used on plastic films to give release or non-stick properties.

Laminating Terms:

psi – Pounds per sq. inch of laminating pressure, determined by the capacity of the laminating press and the glue line area of the product being laminated. A 4’ x 8’ – 50 PSI Air Pod Press will develop 216,000# of pressure. This could apply a little over 60 PSI on a 3’ x 8’ load.

pli – Pounds per lineal inch, used to express the laminating pressure exerted by a Rotary Press. An 8000# capacity Rotary Press can exert 130 pounds per inch of width across a 5’ wide panel.

Glue Line Area – The actual contact area between two opposing surfaces. Many products, such as Hollow Core Doors, may have a glue line area much less than the overall surface area. It is important to consider this to avoid excessive pressure over the glue line area.

Moisture Content – The amount of water found in wood. Expressed as a percentage of its “oven-dry” weight. (Weight of water lost from a fully dried sample/weight of fully dried sample x 100 = MC) Usually measured with a two-pin type moisture meter. 6 to 8% is a typical range for laminating purposes. Freshly forest-cut “green” wood may have a moisture content of 30% to more than 200%, depending on the species. Before using any wood, it needs to be dried to reduce its moisture content. The “ideal” moisture content depends upon the use of the wood and the annual average relative humidity at the place where the wood is to be used. It is critical that the wood you work with be dried down to an MC within 2 percentage points of the equilibrium moisture content (EMC) of the in-use location. The EMC of air is numerically equal to the MC that will eventually be attained by any piece of wood when stored indefinitely at a particular humidity. Temperature has no direct effect on MC or EMC. The relative humidity (RH) in most homes and offices in the U.S. (except in coastal areas and the exceptionally dry areas like the desert Southwest) averages 30 to 40% RH. This is 6 to 7% (see Figure 1), which means that wood in interior locations will average 6 to 7% MC. Therefore, lumber intended for interior use should be dried to 6 to 7% MC and should be kept at this MC prior to and during manufacturing.

High Solids – This term is usually applied to PVA type glues. Many of these are lower than 50% solids by weight. Glues above this range are typically classed as “high solids” and generally exhibit greater initial tack and quicker curing.

Green Strength – The ability of a glued assembly to acquire a good percentage of its final bond strength shortly after pressure is applied. Particularly valuable when bonding materials that resist lying flat, or to allow edge trimming shortly after laminating.

Fast Tack – An adhesive that quickly develops a bond, usually high solids product.

Shear – A load placed on a glue line parallel to the glue line, i.e. a piece of tape being pulled down a wall.

VOC – Volatile Organic Compounds are the solvent components in a finish.

Inline Process – An operation whereby a product goes from one operation to another with no interruption in the flow.

Batch Operation – An operation where a batch of materials is processed through one operation, then the entire batch is moved on to another operation.

Common Substrates and Overlays:

Hardboard – Masonite was one of the original hardboards. This is made of fine wood particles, formed into a mat with adhesive and pressed to make a dense product, usually 1/8" to ¼" in thickness. The density is about 60-65#/cu.ft.

Particleboard – An engineered wood product, made up of various size particles, of differing shapes, used for core material in many furniture operations. Weight is about 45#/cu.ft.

MDF – Medium Density Fiberboard is also about 45#/cu.ft., but the particle size is small, which gives it a better surface and edges for finishing or laminating.

OSB – Oriented Strand Board is another engineered wood product made of large oblong flakes of wood, bonded with a waterproof adhesive, to compete with exterior plywood. The species of wood used to manufacture this is generally faster growing than that used for plywood.

EPS – Expanded polystyrene is used as a core material in insulated panels; such are used for housing or refrigerated warehouses. Low density, about 1 pound per cubic foot.

Wood Veneer – Solid wood that has been cut into very thin sheets, from 1/85 to 1/8" usually. Most veneer, especially in the thinner varieties, is highly decorative and used over Particleboard or MDF for fine furniture or paneling. Thicker veneers are used to make plywood and are laminated cross-grain to enhance performance qualities.

HPL – High Pressure Laminate. This is formed with various layers of paper, impregnated with a resin, then pressed to form a durable product, widely used for kitchen countertops, dinette tables, etc. The top layer is usually a decorative paper, but some non-decorative products are also used in the electronics industry.

Melamine – This term is often used to refer to HPL since the top or wear surface is a melamine resin. Melamine can also be a type of adhesive.

Backer sheet – A sheet glued to the backside of a panel to give it dimensional stability, commonly a wood veneer or a non-decorative sheet of HPL although different materials and even liquid coatings have been used for this purpose.

Pre-Impregnated Papers – Paper treated with a resin to give better physical and wear properties. Widely used for some types of wall paneling and lower end furniture panels.

Vinyl Film – A PVC film, usually decorative, used as an overlay for kitchen cabinets and RTA furniture, also laminated to metal for cabinets for household appliances.

Plastic Films – Various types of films are available to meet different end uses, in general they are handled similarly to vinyl films.

Non-Woven Products – Generally similar to a fabric, but not constructed in a regular interlaced pattern.

Solid Core – Doors or other panels having a facing sheet and a backer sheet over a continuous core.

Hollow Core – Doors or another product having a non-continuous or hollow core, such as honeycomb.

Stiles & Rails – Generally used to describe the vertical and horizontal portions of a hollow core door.

Loose Lay-up – The assembling of the portions of a hollow core door using loose stiles and rails, along with the lock blocks and honeycomb core. An experienced crew can produce a good quality door using this manner of assembly.

SIP – Structural Insulated Panels, commonly OSB laminated to both surfaces of EPS core material using a two-component polyurethane adhesive. As the name implies, these panels exhibit both insulating and structural values.

Visco Elastic – NASA memory foam, also called visco-elastic foam, was developed for the space program in the 1970's, although it was never actually used in the shuttle. It was created as a material for the astronauts' flight chairs, to help reduce pressure points caused by the G-forces generated during lift off. A few years later, it entered the medical field for use in hospital beds, and before long, it was showing up in people's bedrooms. New technology and production processes have solved many of the old problems, like heat buildup and durability, and now memory foam can be found in homes around the world.

Misc. Technical Terms:

Kw – Kilowatt, 1000 watts, also 3412 BTU

BTU – British Thermal Unit, a measure of heat, like a calorie, but of much higher magnitude.

CFM – Cubic Feet per Minute, used to describe air requirements to operate power tools, ventilate an area or collect dust from a woodworking operation.

F.P.M. – Feet per minute, typically describing line speed.

T.I.R. – Total indicator run out. A measurement of the total variance in the surface of a roll as measured by a stationary mounted dial indicator.

ROI – A roll opening indicator used to express the opening between two coating or laminating rolls.

Roll Deflection – The "bending" of a roll caused by a load, either from an object passing under the roll or from the hydraulic force of a liquid between two rolls. This increases with speed. Causes a variation of pressure across the roll or results in an uneven coating.

Coating to Doctor Roll Ratio – The surface speed differential between the coating or application roll and the metering or doctor roll. On many Black Bros. machines this ratio is 6:1 and this allows a more even "doctoring" or metering of the material being applied.

Electrical Terms:

Amp Draw – The current drawn by an electrical motor or heater, commonly described in amps.

Drive – That portion of a machine that provides power to turn the rolls and propel the stock through the machine. A drive commonly consists of a motor and a reducer, and often a belt case or mechanical speed change device.

Motor – The rotating electrical portion of the drive.

Reducer – That portion of the drive that reduces the speed of the motor to the rotational speed necessary to operate the machine at the proper line speed.

Belt Case – A variable pitch sheave arrangement to change the input speed from the motor to the reducer. Other mechanical devices may also be utilized.

Inverter – An electrical device that converts direct current (DC) to alternating current (AC)

Direct Drive – Driving a roll or set of rolls directly from the output shaft of a reducer to give a smoother operation than may result from an external chain or gear drive.

Solenoid – An electrically controlled switch to control the flow of power to a motor.

Relay – A solenoid commonly used in a control circuit.

Reset Button – A momentary push button used to "reset" a tripped relay or over current device.

24 Volt Control – A control circuit operating at 24 volts, rather than at full line voltage, used to provide a greater degree of safety for the machine operator and for better control circuit versatility. 110-volt control circuits are also fairly common.

Without Controls & Drives – Occasionally a machine is furnished in this manner where another party is going to supply the controls and drives to better fit in with the overall electrical package within the plant. Equipment maintenance can also be a factor for having one contractor supply all of the drives and controls.

Explosion Proof – Equipment with cases designed to operate within an atmosphere of explosive vapors and capable of containing any explosion that may occur within it.

Water Tight – Equipment with cases constructed to prevent the entry of moisture.

Rubber Rolls – Rubber covered rolls are an important part of many Black Bros. machines. They allow applying a controlled amount of glue or coating material, as well as applying pressure for various laminating operations. A few of these rolls, and their usage follows.

Neoprene – Rolls of Neoprene are perhaps the most widely used rolls in Black Bros. equipment. They are durable, but yet can be ground and grooved cleanly, that is, without tearing. Grooved Neoprene rolls have been used for years for applying many adhesives in the woodworking industry. Grooves that are ground into these rolls, and the hardness of the roll itself, help to attain the proper application rate. Generally used for water base products and at room temperature.

Buna N – This is another general-purpose covering. While some rolls may be grooved, many are used as smooth rolls for applying various oils, such as for metal drawing operations or for tempering hardboard. They have relatively good heat resistance, and are resistant to certain solvents that may attack Neoprene.

Urethane – Rolls made of cast Urethane are used for application of various paint coatings. They have good solvent resistance to the Aromatic Solvents, like Toluene and Xylene, and the surface can be ground very smooth to assure a good lay-down of material.

EPDM – Also use for coating rolls, especially with active solvents, such as Acetates, Ketones and Ethers. The surface is normally ground smooth, but for certain applications, a fine grooving may be used.

Silicone – This polymer has found great use in applications involving heat above 250 degrees. Specifically in the application of Hot Melt PUR adhesives. In addition, the release properties of this compound help in cleaning difficult materials from the roll surface.

Double Sleeve Rolls – This is a special type of construction, consisting of a soft base, or cushion material, covered by a harder outer sleeve. This is done to allow for variation in the thickness of the stock being coated without changing the amount of coating being applied. While quite useful for certain applications, the higher cost of this roll needs to be considered.

Rubber Roll Nomenclature:

Duro – This describes the hardness of a roll. It is generally measured using a portable instrument called a Durometer, using the Shore "A" scale. Coating rolls are in the 20 to 50 Duro range and glue spreader and laminating rolls are about 65 Duro.

Helical Grooving – This is actually a thread ground into the surface of the roll. The pattern of the groove, along with the coarseness and the depth determine the range of coating thickness that can be applied. Most groovings are in the range of 8 to 28 threads per inch. "Buttress" shaped grooves are used for applying wood adhesives to veneer stock.

Composite Grooving – Composite grooving consists of both a Helical Grooving and a Longitudinal Grooving. Sort of like a crosshatch. This grooving is usually based on a "V" shaped groove and is useful for applying adhesive to solid stock, such as particleboard core stock and the stiles and rails of hollow core doors. This pattern allows using more pressure than the Helical Buttress grooving without getting "wring-off" at the end of the stock.

Ground and Polished – Some rubber rolls used in critical coating operations are first ground smooth, using an abrasive wheel or belt, then hand-polished using a fine grit paper to obtain a very smooth surface finish.

Expander Rolls – Typically referred to as a "Mt. Hope" roll (one of the primary manufacturers). This roll uses a bowed shaft on which is placed a series of bearings, which are covered with a rubber sleeve. As the surface of the roll revolves, the sleeve expands along the length of the roll to smooth out a web of paper or vinyl as it passes over the surface of the roll. Very effective. These rolls are available in both a "fixed-bow" and an "adjustable-bow" version to meet different requirements. Chevron rollers are usually supplied for rigid webs like paper and Mt. Hope are for flexible webs like vinyl or foam.

Chevron Rolls – These rolls have a pattern cut into the surface to allow the action of the roll to expand a web of material as it passes over the roll. The pattern is usually cut into the roll in a "left hand" – "right hand" pattern, starting at the center of the roll surface. Perhaps less costly than the "Mt. Hope" roll, but they can induce lines in the material being spread if the web tension is too high.

Chrome Plated Rolls – Chrome plated rolls are used for various purposes, doctor rolls, feed rolls and, in some cases, coating rolls. Here are some of the various surface treatments used.

Flash Chrome – This is perhaps the lightest application of industrial chrome. It is economical, gives a good appearance, allows easy cleaning and is useful where the surface demands are not great.

2CP – This is .002" of Chrome Plating on the surface of a roll, used to eliminate rusting or mild corrosion. May be used on doctor rolls where severe corrosion is not a problem.

1N-2CP – This uses a .001" layer of Nickel under the .002" of chrome to provide a greater barrier from corrosion due to the chemical nature of the coating or adhesive. Used on many Glue Spreader doctor rolls.

5CG – This amounts to an average of 005" of chrome, to allow the surface to be ground to attain minimum TIR. A good application for doctor rolls used with smooth coating rolls for paint or coating applications. Also used as a coating roll for Reverse Roll Coaters for web stock and as the Reverse Wiping Roll on a RRFM.

1N-5CG – As above, this uses a .001" layer of Nickel under the .005" chrome coating to provide maximum corrosive protection and still allows the surface to be ground to obtain an accurate surface.

Engraved Rolls – Some doctor rolls are mechanically engraved with a fine pattern to apply a specified amount of coating material. See Precision Roll Coater. Rotates at a 1:1 surface speed ratio with respect to the coating roll.

Conversion Factors:

Electrical: 1 Kilowatt = 3412 BTU
1 Horsepower = 746 Watts

Pressure: 1 Bar = 1 Atmosphere (approx) = 14.7 psi

Length: 1 Meter = 39.37”

1 Kilogram = 2.2. Pounds

Temperature: 9/5 C + 32 = F
-32F x 5/9 = C