TRAINING COURSE FOR REPRESENTATIVES OF

THE SHERWIN-WILLIAMS CO.

TEXT NO. 2

S-W ODP WHITE LEAD

THE EMBLEM OF QUALITY

SHERWIN-WILLIAMS PRODUCTS

We are now ready to take up the study of the elements which, from the earliest days of the paint industry, have been found to make a good paint. Hereafter the term "Paint" shall be used in the sense commonly understood by the public: A liquid or semi-liquid composition to be applied to surfaces for the purpose of beautifying or protecting, or both.

Now it is obvious that the protective and beautifying values of paint will depend entirely upon the character and quality of the materials used. The materials which together make paint are divided into Solids and Liquids. The Solids are called PIGMENTS—the Liquids, VEHICLES. The term "vehicle" aptly describes the characteristic function of the Liquids—it transports or carries Pigments over surfaces.

Good paint must be made of pigments and vehicles which, when combined, will have the following virtues:

Ease of Application.
Covering.
Opacity.
Binding.
Permanency of Color.
Durability.

Mud may be said to be a coating, but it is a poor paint for it lacks durability, binding and other qualities. By adding more water it would have ease of application but poor paint it would remain for the thinning would depreciate its hiding quality; though the finest color pigment be added, the solids would disintegrate and the colors have no permanent effect because of lack of binding quality in the liquid.

Pigments which enter into paint must in their very nature be qualified to "protect" the surfaoe to which they are applied and be able to work agreeably with the other elements used in the mixture.

Keeping in mind the high qualities which are demanded of the component parts of good paint, let us consider the vehicles and pigments of good paint. As to the order in which the parts shall be studied—whether vehicles or pigments first—it might be said to be somewhat like the old conundrum: "Whioh is first—the hen or the egg?"

Linseed Oil is the most important liquid used in paint.

White Lead is the most important pigment.

White Lead may be said to be the Body of paint—Linseed Oil the Soul of paint.

LINSEED OIL

Linseed Oil is universally used in good paint because when mixed with White Lead, applied to a surface and allowed to dry, it is found that it develops a tough, smooth film. It also holds together the pigment in SUSPENSION and BINDS THE PIGMENT TO THE SURFACE. If we could have followed the oil from the moment of application, we should have seen it working diligently, every moment, gathering oxygen from the air for the purpose of changing itself from a wet liquid to a smooth, tough, solid film. Other oils also have this tendency. Oils which thus dry are known as Drying Oils. With one exception, all the drying oils are vegetable oils.

The oil used in a lead and oil paint must do four things above all others:

FIRST: It must BIND the pigment to the surface: otherwise we could just as well use water. If the pigment is not bound to the surface, then the covering or hiding property of the pigment is of no use for it would not stay on the surface. But covering or hiding of a surface is one of the important functions of a pigment.

SECOND: The oil must DRY—and dry reasonably quickly.

THIRD: The oil must not only bind the pigment and itself to the surface, but it must act in a BONDING manner so as to unite all the pigment particles into a close-knit, tenacious film.

FOURTH: It must be DURABLE, for it is upon the hard, tough body of the transparent oil that the film depends for its life—its wear.

Now, Linseed Oil has these combined Binding, Drying, Bonding, Durable qualities inherent to a higher degree than has any other oil.

This remarkable oil has a proud history.

Linseed Oil is the product of the flax plant. The flax plant was cultivated by early man neither for its seed nor oil. Its earliest use was for making linen cloth. The first use of the seed was for medicinal purposes. It was likewise used as a food—an excellent food. Today in the United States over 40,000,000 bushels of flaxseed are consumed annually in the manufacture of linseed oil, 75 per cent of which is used in the manufacture of paint and varnish, the balance being used principally in lithographic inks, linoleum, etc. Most of the supply comes from Montana, Minnesota and the Dakotas. To produce this amount of seed about three million acres of land are required. Outside the United States, large quantities are raised in Canada, Argentine, India and Russia.

The proper preparation and use of Linseed Oil involve profound study and investigation which even today are far from completion.

In the manufacture of Linseed Oil the flaxseed is first separated from foreign seeds and any other impurities which may be present, and is then ground in the roller mills. The meal is then pressed into cake forms, which are stacked, one above the other, in a high power hydraulic press. Enormous pressure is applied and the oil is filtered and collected in settling tanks. Here the sediment collects at the bottom of the tank and the clear oil is drawn off and sold as Raw Linseed Oil.

Linseed Oil, because of certain chemical reasons not necessary to go into at this time, has a characteristic property of ABSORBING OXYGEN, or "drying" and thereby becoming converted into linoxin—the characteristic rubber-like product of "dried" linseed oil. The introduction of certain metallic compounds into the oil will hasten this process.

Linseed Oil is without doubt the most satisfactory paint oil for general use, known to us today. When used with other oils, each having its specific purpose, it may be said to be a "big brother," as it lends its beneficent qualities to them in a helpful way.

When the oil comes from the presses it may be improved by ageing. During this ageing period certain changes take place in its body which are extremely wholesome to the oil.

Linseed Oil will not produce its best work unless it has aged at least three or four months, or unless it has been most completely filtered and refined. This delay costs the manufacturers large sums of money in storage tanks, stored oils, etc. The conscientious paint manufacturer, however, would hesitate to use unaged oil in paint. The Sherwin-Williams Co. may point with pride to their large storage facilities and the great care used in making, handling and ageing their linseed oils. Sherwin-Williams products are of the first quality because the component parts of the products are surely first quality. Indeed so pure is our Linseed Oil that for many years we marketed it for medicinal purposes.

The oil having aged, or become completely filtered and refined, becomes more clear and improved in drying properties and gloss. Nature truly has done a splendid piece of work in the creation of the flaxseed, for the very remnants of the seed after the pressing out of the oil are used as food for cattle, the oil content being about 5 per cent.

Now, Raw Linseed Oil heated carefully will become lighter in color. This heat-treated oil is commonly called Bleached Oil. If we should heat Raw Linseed Oil to a temperature of about 500 degrees F. we should find a change taking place in it. Whereas it has started as a clear oil, now jelly-like clouds appear floating through it. When this condition appears we call it "the break." The break is taken out of it by careful treatment but the oil thereafter is darker.

Again, by certain treatments Raw Linseed Oil may be heated for bleaching without "the break" taking place, and still be clear and light with a honey-like consistency. This we call "Varnish Makers Oil." Such treated Linseed Oil is used in enamels and varnishes of light colors. The term "Stand Oil" is frequently used among the paint trade to describe varnish makers oil that has been allowed to stand for a long period.

If Lead, Manganese, Cobalt or Nickel be added to heated Raw Linseed Oil, the oil is termed "Boiled Oil." This is generally used for darker colors.

Lack of attention on the part of man may bring to naught all the marvelous characteristics with which nature has so richly endowed Linseed Oil. For many a painter, professional and amateur alike, has spoiled his paint by carelessness or lack of knowledge in assembling and mixing the component parts of his paint.

If we have wondered at the marvels of Linseed Oil, we shall not be less amazed as we now take up the study of the major pigment of paint—White Lead.

WHITE LEAD

Whereas the flaxseed had to pass through a process of pressure to become oil, Lead must pass through a process of acids, gases, fumes and heat before it can claim the right to be incorporated with Linseed Oil to form paint.

There are two principal forms of White Lead—Carbonate and Sulphate.

The modern methods of transforming lead into White Lead Carbonate are the Old Dutch Process and the so-called Quick Process. They are processes of corrosion (rust). The object of lead corrosion is to transform the metallic lead into a fine white powder. To this powder chemists have given the name White Lead Carbonate.

Briefly, the steps in the Old Dutch Process are as follows:

Having secured a good quality of metallic lead in the form of heavy bars, generally known as pig lead, the first operation is to melt it by placing it in a suitable furnace; then this molten lead is poured into shallow iron moulds to form what is termed "buckles." It will be noted that this operation makes no change in the composition, but merely gets the lead into a more suitable form for corrosion. These buckles are about 7 inches in diameter and about one-eighth inch in thickness, and weigh about 12 ounces each. The object of making the buckles of this shape is to cause a comparatively small weight of the metallic lead to expose a relatively large amount of surface to be acted upon by the corrosive elements which we shall now describe.

These buckles are packed into earthenware crocks known as "pots," shaped much like the ordinary flower pot. These pots previous to being filled are placed in position in the corroding stack. This stack is usually in the form of a rectangular building, the walls of which are either brick or wood.

The method of "charging" the stack is first to put in a layer of spent tan bark (this being considerably coarser than ordinary sawdust), then a tier of pots is placed on the layer of bark. A weak solution of acetic acid of about the same strength as common vinegar is poured into the pots. Next the pots are filled to their capacity with the lead buckles; after this the tier of pots is covered closely and securely with boards, forming a close floor and a foundation for another layer of bark and tier of pots.

This operation is repeated time after time until the stack is completely filled. A stack in our White Lead Plant at Chicago when filled as described, will contain about 67 tons of Metallic Lead (or 134,000 pounds).

It is interesting now to see what takes place in this stack. Each layer of tan bark when put in the stacks is moistened with water; this causes the tan bark to "heat"—and if closely confined it will generate a very high temperature. A very complicated set of chemical actions and reactions takes place during which time the acetic acid solution gradually vaporizes, much of it finally escaping through the vent provided. The heat of the tan bark at the same time generates carbonic acid gas which also acts upon the Lead. These chemical actions are quite rapid, yet it requires some 120 days or more for the forces at work in the stack to come to rest. During this time the buckles of metallic lead have gradually become transformed to a white mass which is removed from the pots and passed through various operations for purification. Briefly, the purification consists in separating small particles of metallic lead which may not have been corroded and also to remove any pieces of bark which may have gotten into the pots, and further, to remove any traces of acid which might remain. The process involves transforming the corroded mass into a fine powder through the use of a crusher, after which it is mixed with water in huge vats and after being thoroughly washed, the wet mass, now a thin paste, is passed through a sieve or screen of 350 mesh or threads per inch.

Finally the wet mass is placed on great copper pans and heat is applied which drives off the water, leaving the white lead in lumps, which are passed through a mill which crushes them to a fine powder ready to be packed into barrels for marketing in dry form.

In the so-called Quick Process, the same principle of "corrosion" takes place, but the lead is run into fibres, like thread or wire, so that the process of "corrosion" takes place with greater rapidity. The difference in process makes no difference in the character or quality of the product.

Why is White Lead such a good white pigment?

For many reasons. Here are some of the chief ones:

A. Natural affinity for Linseed Oil.
B. Ease with which it is applied.
C. Opacity.
D. Spreading.
E. Whiteness.
F. Applied to a surface, the paint film will wear away gradually, beginning with the surface of the film, and make a good surface for repainting.
G. Assists in drying the oil.
H. Keeps its identity as against going into solution—each particle always retains its lead characteristics.
I. Durability.
J. Centuries of successful usage have demonstrated its unexcelled fitness.

A. BY NATURAL AFFINITY we mean that when Linseed Oil is mixed with lead there is such a spontaneous reception of the lead into the oil that an absorbing oneness takes place, whereby the oil gives itself to the lead and the lead gives itself to the oil. This union is so perfect that they become the very essence of smoothness, unlike the result which would follow if we should mix milk with cracker dust, or water with sand. In these latter cases, the liquid simply soaks and wets the body elements respectively. Lead and Linseed Oil lose themselves in one another so that when we look right into the mixture, it is impossible to differentiate between the one and the other.

Try to mix melted butter with flour—the result is lumps. They may be ground and whipped together, but the fine, agreeable union of the two elements would not come about, for the reason that there is no "affinity" such as characterizes Lead and Linseed Oil.

B. By EASE OF APPLICATION we mean the ease with which it may be applied, with the minimum amount of muscle, for the cost of labor in applying paint is about two-thirds the total cost of painting a surface. That is, on a $300 job the painter figures the paint to cost him about one-third of the $300. It is very necessary for economic reasons, therefore, that a paint shall be easy to apply.

C. OPACITY. White Lead is opaque—the particles are fine, but they do not permit light to pass through them. If we take many of these opaque particles and mix them with oil and spread it upon a surface, we shall find that the lead particles will hide or obscure the surface. The opacity of White Lead then is beneficial in paint, because it covers or obscures the surface.

D. SPREADING. Because of the fineness of the particles of lead and their agreeable disposition with Linseed Oil, they spread out over the surface and do so uniformly.

E. White Lead produces a clean, smooth, WHITE surface.

F. It is highly important that a paint film shall wear away in such a manner that the surface will be in good condition for repainting. A White Lead-Linseed Oil film will wear away gradually and from the outside. The forms of the particles of the wearing film may be powder-like or flake-like. It is this kind of wearing away that makes the best surface for repainting.

G. White Lead draws oxygen from the air and with it helps to dry the film.

H. Lead particles will maintain their identity; that is, once an opaque lead particle, always an opaque lead particle. It does not dissolve in "mixing" with the other elements in the paint, but it always retains its individuality—thus giving it permanence. It does not go into solution.

I. Lead Carbonate and Linseed Oil paint spread upon an exterior surface will wear for three to five years, depending upon weather conditions, etc. It may not be, in point of durability, as strong as some other minerals, but it is nevertheless durable, as this film of lead and oil paint surely has done a good job if it has protected and beautified a surface for three to five years.

J. Wherever Lead-Linseed Oil paint has been used throughout the world, it has given good service.

White Lead Carbonate ground in Linseed Oil, in the proportion of 90 per cent Lead and 10 per cent Oil is known as Lead and Oil Paste Paint. In these proportions we have a very thick paste. The name which we give our Pure White Lead Carbonate and Pure Raw Linseed Oil thus ground together is O. D. P. (Old Dutch Process White Lead).

Now, though this Lead and Oil paste is fundamentally paint, it is in such a thick form that it is not practical for application to a surface. What shall we do about it? Well, we have seen the great importance of Linseed Oil as the natural vehicle and binder, and have seen it in film form—a tough, durable body. These are excellent qualities. If then Linseed Oil has such a wealth of qualities and has also such a natural affinity for White Lead, what better vehicle than Linseed Oil can the painter use to bring the paste paint to painting consistency. He can use none better. Is the oil the life of the paint? —Yes. Then let's put more life into it. Therefore when the painter receives his Lead ground in Linseed Oil, he adds more Pure Linseed Oil, thus bringing the paste to a more fluid consistency. But, even so, it may be found that the mixture requires too much muscle to spread upon the surface and the film it makes is too thick or "heavy" for best results. A good paint will "work easily under the brush." The phrase is constantly used by painters to describe the ease and smoothness and the FREE FLOWING of paint UNDER THE BRUSH. So he adds what is known as a Thinner.

THINNERS

The Thinner more readily spreads the lead and oil out over the surface. This gives us the very important advantage of being able to apply the paint in thinner coats one on top of the other. It is an invariable rule in good paint practice that two single coats are better than one thick coat, for much the same reason that a given piece of cloth made into two coats will protect the human body from air and moisture better than the same cloth made into one heavy coat.

Pure Spirits of Turpentine is the only thinner that can be used with complete reliability to thin Lead and Oil Paint. It is the essential oil of certain pines growing in the Southern parts of the United States and other warm climates. The method of taking turpentine from the tree is rather primitive. An incision which, because of its peculiar shape is called a "box," is made in the tree, which permits the sap to exude. The sap is distilled, the fluid separating from the mass. The fluid thus obtained is called Turpentine—the residue Rosin.

Turpentine is not the only thinner used in paint, but it so perfectly and naturally meets all the requirements of an ideal thinner that it would almost seem as though nature had especially designed it for service in paint. The world supply of Turpentine is greatly inadequate and is rapidly diminishing. Scientists have recognized this situation, however, and already other good thinners are coming into being.

Now the requirements of a Thinner are absolutely fixed:

1. The Lead and Oil having been reduced to a working consistency, the Thinner must so commingle with the mixture that the result will be a paint mixture that flows easily and smoothly under the brush.

2. The Thinner must not in any way, either at time of introduction into the Lead and Oil or during the life of the paint film, cause any chemical reaction whatsoever, for Lead and Oil constitute this good paint and nothing should be added that will in the slightest degree have even a suspicion of harmfulness to either the Lead or the Oil.

3. It must penetrate into the pores of the wood. Turpentine penetrates through the surface into the pores better than any other thinner known to us today. Penetration into the pores is necessary in order to carry the Lead and Oil, and especially the Oil, into the uttermost parts of the surface and subsurface. Thus are the pores thoroughly saturated with Lead and Oil, the walls of each pore are tightened, and the whole field of pores drenched and finally filled with Oil and Lead. This drenching and filling of the pores is commonly known as "sealing the surface" for the process does close the pores and sets up a tight, sealed surface. This sealed surface is the ground upon which the major paint film is to be built—one layer of film (coat) at a time. It is apparent, then, that Turpentine which aids so directly in causing the Lead and Oil to flow freely, does have a vitally important function.

4. Since the Lead and Oil are the body and soul of the paint, we insist that whatever Thinner is used shall, as soon as it has done its job, withdraw agreeably. Pure Spirits of Turpentine does just this. Having fulfilled its mission, it volatilizes (evaporates), leaving no trace whatsoever of its having been present.

A POOR THINNER WILL JAR LOOSE AN AVALANCHE OF TROUBLE FOR THE PAINTER. Always urge that Pure Spirits of Turpentine is the only reliable thinner for Lead and Oil.

DRIERS

It is evident that paint applied will be wet, and there are important reasons why its drying often should be hastened. The longer it remains wet on a surface the greater the possibilities of being rubbed or soiled or being marred by flies and particles of dust and dirt, by being rained upon, etc.

Now, the term "dry" here is quite different from that used in the sense of drying a wet cloth. "DRYING" in the science of paint manufacture, means the hastening of the natural tendency of Linseed Oil to ABSORB OXYGEN from the air. Certain elements may be added to paint to hasten "drying," causing a tough elastic film to form. Lead, Manganese and Cobalt are the popularly used Driers.

Now, these drying elements have no other mission in paint than "to hasten drying." When the oil, by reason of taking in oxygen, has become modified in such a way that it becomes a solid, then we say of it that it has "dried."

It is the natural tendency of Linseed Oil to keep on drying, which means that finally, after a period of years, the film comes to a point where it is literally overcrowded with oxygen, becoming oxidized. At this point it begins to disintegrate. Therefore great care must be taken that only a suitable amount of drying element be used and then only the right kind. Too much drier will shorten the life of the paint or "burn it."

Linseed Oil is a natural but slow drier; mixed with certain metallic salts or oxides it makes an excellent drying agent. Other oils may be similarly used. The pigments thus used are called "Driers." The oils thus used are called "Drying Oils." The different kinds of driers will be treated in a later text.

Linseed Oil and the White Lead Carbonate, Thinner and Drier, are now ready to be mixed to make White Paint. If any other color is desired it may be obtained by adding the proper color pigments.

The Sherwin-Williams Co. manufactures its own colors. These have no superior. We shall take up color pigments in a later text, finding their history and chemical importance equally as great and

fascinating as those of Lead and Linseed Oil. When colors are desired, S-W First Quality Colors in Oil should be used in order to carry out the quality policy of the whole mixture.

We speak of the miracles of the past--phenomena beyond the understanding of man's mind, yet when we see the warm life of the flax-seed breathing its life-giving virtues into the inanimate mineral—lead, and raising it to the high elevation of beauty and usefulness, it is not surprising to find ourselves amazed as we gaze upon the marvelous effect wrought by paint.

Lead and Oil make a good reliable old-fashioned paint. Everyone knows it is good paint. Oil is the life of the paint. No better Linseed Oil than that produced by The Sherwin-Williams Co. has ever been incorporated into paint. We manufacture our own Linseed Oil simply because we can thus assure ourselves of its quality and therefore assure the quality of our paint. Better oil—better paint—our policy does not call for mediocrity—only excellence. No Lead and Oil paint can be better than S-W Old Dutch Process Lead (O. D. P.)

We have gone down into the earth and aloft into the heavens, abroad into the fields, gathering material seen and unseen from the North, from the South, from the East and West, to find the two elements which are the foundation of this good paint—White Lead and Linseed Oil.

Because we control and manufacture our own Lead and Oil, we produce a Lead and Oil Paint that can have no superior. On our label attached to our Old Dutch Process Lead (O. D. P.) is our confident challenge regarding our White Lead:

"This package is warranted to contain nothing but strictly pure White Lead, ground in strictly pure Linseed Oil, and we will pay one ounce of gold for every ounce of adulteration that it may be found to contain."

No salesman can make a lasting success in selling paint unless he BELIEVES completely in the genuine QUALITY of the produot he is selling. Knowledge that the goods he represents are genuine and are needed, develops in the mind and heart of the representative such an enthusiastic conviction that his presentation becomes irresistible. We may well hold our heads up and look the prospect squarely in the eyes and tell our story, for throughout the world the Sherwin-Williams Products are known, and known for their excelling quality.

We have now assembled the various pigments and vehicles—White Lead Carbonate, Pure Raw Linseed Oil, Turpentine and Drier—which combined give us a mixture commonly called Lead and Oil Paint. The mixture is now before us. How shall we apply it to the surface?