



# Finishing

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## Finishes are Comprised of Two Parts

1. Solids – The part which remains after the finish is “dry” and which provides protection
  - A. Shellac
  - B. Lacquer
  - C. Urethane
  - D. Oil
  - E. Wax
2. Solvent or Diluent – The part which “liquefies” the finish, making it easier to apply
  - A. Alcohol
  - B. Lacquer thinner
  - C. Mineral spirits
  - D. Water
  - E. Etc.
3. Exceptions: Not all oils and waxes require a solvent or diluent



# Two Classes of Finish

1. Evaporative
2. Reactive



**Evaporative**: The molecular structure of the solids in the finish does not change as the finish “dries”. The finish can be re-dissolved by the *solvent*

**Reactive**: A chemical reaction takes place. The molecular structure of the solids changes as the finish “dries”. The finish cannot be re-dissolved by the *diluent*



## Examples:

### 1. Evaporative:

- A. Shellac
- B. Lacquer (non-catalyzed)
- C. Wax

### 2. Reactive:

- A. Varnish
- B. Some oils (those which permanently harden as they dry)
- C. All catalyzed finishes (catalyzed lacquers and varnishes, epoxy and acrylic resins)

### 3. Exceptions: Some oils are neither evaporative or reactive (mineral oil, olive oil, etc.)



# Advantages and Disadvantages of Evaporative and Reactive Finishes

## 1. Evaporative:

- A. Advantages: Easy to repair
- B. Disadvantage: Delicate, easily damaged, especially by solvent

## 2. Reactive:

- A. Advantages: Hard and tough, especially some of the newer catalyzed lacquers and varnishes
- B. Disadvantages: difficult to repair. In some cases impossible to repair, requiring complete removal and reapplication (sand down to bare wood and start again)





# Solvent vs. Diluent

1. A solvent dissolves the solids in the finish. The finish can be re-dissolved later (even years later)
2. A diluent "liquefies" the finish but does not (is unable to) dissolve the solids in the finish.



# Characteristics of Various Finishes

1. Wax
2. Oils
3. Oil with Additives such as Urethane
4. Shellac
5. Lacquer
6. Catalyzed Lacquer
7. Varnish
8. Catalyzed Varnish





# Wax

1. Examples:
  - A. Bees wax
  - B. Carnauba wax
  - C. "Hut"
  - D. Prepared paste waxes (Briwax, Mylands, Liberon)
  - E. Spray waxes (Pledge)
2. Advantages:
  - A. Exceedingly easy to apply
  - B. Exceedingly easy to repair
  - C. Non-toxic (after solvent has flashed off)
3. Disadvantages:
  - A. Minimal protection
  - B. Some worse than nothing (Pledge)
4. Note: Wax is usually an evaporative finish. Most wax finishes contain a solvent, such as mineral spirits, which softens the wax, making it easier to apply. The solvent usually evaporates after application, allowing the wax to harden.



# Oil

1. Examples:
  - A. Linseed oil
  - B. Tung oil
  - C. Vegetable oils
    - 1) Walnut oil
    - 2) Olive oil
  - D. Mineral oil
2. Advantages:
  - A. Exceedingly easy to apply
  - B. Exceedingly easy to repair
  - C. Usually not toxic (see note below)
3. Disadvantages:
  - A. Very little protection, easily damaged
  - B. Dull appearance
  - C. Can become rancid (e. g. olive oil)
  - D. Some never dry completely hard
  - E. Darken the wood
4. Note: Typically vegetable and mineral oils do not require a diluent. Some oils, such as linseed and tung, are somewhat reactive and may contain a diluent such as mineral spirits. They may also contain dryers, which can be toxic.



# Oils with Additives such as Urethane

1. Examples:
  - A. Watco Danish Oil
  - B. Deft Deftoil
2. Advantages:
  - A. Easy to apply
  - B. Relatively easy to repair
  - C. Tougher than oils without additives
  - D. Much better “build” than oils without additives
  - E. Oils penetrate and give “depth” to the finish, while urethanes provide “build”, toughness and durability
  - F. Usually food safe once completely dry
3. Disadvantages
  - A. Can be damaged by water, food, acid (e.g. citric acid)
  - B. More difficult to repair than oils without additives
  - C. Usually toxic until completely dry
  - D. Unpleasant odor until completely dry
4. Note: Oils with additives are reactive and are usually comprised of either linseed or tung oil with urethane additives. The diluent is usually mineral spirits (refer to manufacturers’ specifications)



# Shellac

1. Examples:
  - A. Super Blond
  - B. Orange
  - C. Garnet
  - D. Dry (flake, button, seed)
  - E. Canned (ready to use), e.g. Bull's Eye/Zinsser
  - F. French polish (shellac and oil, usually linseed)
  - G. Etc.
2. Advantages:
  - A. Very clear
  - B. Relatively easy to apply and repair
  - C. Excellent sealer, compatible with oils, lacquer, varnish
  - D. Non-toxic
  - E. Soluble by alcohol, even when completely dry
  - F. "Authentic" for antiques
3. Disadvantages:
  - A. Easily damaged by water, and especially by alcohol
  - B. "Membrane" finish
  - C. Limited shelf life after being dissolved in alcohol
4. Solvent: Ethanol (ethyl alcohol)
5. Note: Shellac is an evaporative finish.



# Lacquer

1. Examples:
  - A. Nitrocellulose (cellulose nitrate)
  - B. Acrylic
  - C. CAB (cellulose acetate butyrate) “water white”
  - D. Non-catalyzed (traditional), pre-catalyzed, catalyzed
  - E. Water based
2. Advantages:
  - A. Easy to apply, especially if sprayed (but requires considerable skill)
  - B. Very clear
  - C. Capable of attaining very high reflectivity, very glassy (piano finish)
  - D. Soluble by lacquer thinner. Very easy to recoat, and relatively easy to repair (except catalyzed)
  - E. Catalyzed lacquers are extremely tough, durable, clear
  - F. Generally not toxic once completely dry
3. Disadvantages:
  - A. Tricky to apply, requires practice, skill
  - B. Somewhat delicate: scratches easily (except catalyzed)
  - C. “Membrane” finish
  - D. Solvents and diluents are often quite toxic
  - E. Catalyzed lacquers, while extremely tough and durable, require special handling, knowledge, and skill
    - 1) Limited “pot life”
    - 2) Much more difficult to repair
    - 3) Clean-up must be immediate and thorough
  - F. Expensive. Lacquer in spray cans is extremely expensive when the cost is measured in dollars per ounce. Lacquer in bulk is much less expensive, but spray equipment is expensive (gun, compressor, regulators, line dryers, spray booth, mask). State-of-the-art urethane automotive lacquers are very expensive, even in bulk.
4. Solvents and diluents: Lacquer thinner for traditional lacquers. Catalyzed lacquers usually require special diluents (follow manufacturers' recommendations). Water for water based lacquers.
5. Note: Traditional lacquers are evaporative. Catalyzed lacquers are reactive.





# Varnish

1. Examples:
  - A. Natural oil-based (tung, linseed, etc.)
  - B. Urethane-based (polyurethane)
  - C. Blends
  - D. "Spar" (flexible)
  - E. Catalyzed
  - F. Etc.
2. Advantages:
  - A. Many different chemical compositions to choose from
  - B. Can be exceedingly tough, especially catalyzed urethane varnishes
3. Disadvantages:
  - A. Relatively difficult to apply
    - 1) Not easily sprayed
    - 2) Tricky to brush
    - 3) Difficult cleanup
  - B. Not easy to recoat. Must be "roughed" before recoating
  - C. Difficult or impossible to repair (may require sanding to bare wood and starting again from scratch)
  - D. Membrane finish
  - E. Usually toxic until completely dry. Vapors of some diluents are quite toxic.
4. Dilutant: Mineral Spirits for traditional varnishes. Catalyzed varnishes often require special diluents. Follow manufacturer's recommendations.
5. Notes: Use only gloss varnish. The flattening agents in satin varnishes usually compromise the finish to some degree. If a satin finish is desired, use gloss varnish, allow the finish to dry hard, then rub the finish with an abrasive to produce the desired glossiness.



# Sources of Supply

**Easy Cast Clear Casting Epoxy, Hobby Lobby, others**

**Trans-Tint Dye, Woodcraft, others**

**Pipettes, numerous internet sources**

**30 ml measuring cups, numerous internet sources**

**Deftoil Danish Oil Finish, clear, McGuckin Hardware, Boulder, other sources**

**Minwax Wipe-On Poly, Clear, Woodcraft, others**

**Mirka Abralon 2000 grit foam-backed abrasive, Woodcraft, others**

**Titanium dioxide, make-up supplies, numerous internet sources**

**6 mil polypropylene sheeting, numerous internet sources**

**Heat sealers (to seal polypropylene bags), Amazon, numerous internet sources**

**Nitrile gloves, Costco, numerous internet sources**

**General finishing supplies, Woodcraft, Homestead Finishing Products**

**Book, Finishing by Jeff Jewitt, Taunton Press**





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