Up in Smoke

An article for audiophiles from Richard Nelson, a Colorado Audio Society member

No, this is not about your marijuana stash, but rather something of importance to you vinyl collectors. So if you’re not a vinyl collector, don’t waste your time reading this, just go watch the hilarious Cheech & Chong movie of the same title (from 1978).

Before we get to the smoke, I thought it helpful to very briefly describe the process of creating your beloved vinyl. It’s much more complicated than what I describe here.

The process starts with a musical source usually on analog magnetic tape or a digital file. Once in a dozen blue moons music is recorded “direct-to-disc”. A mastering lathe is used to cut a record that is playable on your stereo. Unfortunately, the material needed for mastering must be soft so the groove can be chiseled out by a heated cutting stylus. Acetate used to be the common mastering material but it was replaced by lacquer decades ago. The soft lacquer is applied to an aluminum disc to provide physical stability through guarded proprietary processes. This cutting process creates a very long thread of removed lacquer material that is picked up in a vacuum tube and eventually disposed of. You could play the master disc but you’d wreak irreparable damage to it.

So now you have an original side of an LP. This process is repeated for the B side. Now there are two master discs which may or may not be playable. Problems such as incorrect cutting depth or cutting into the previous adjacent groove can make these masters worthless - but you won’t know for several days and many dollars. That’s why a record mastering engineer gets the big bucks (he wishes) as he’s the first line of defense against an expensive scrap pile of master discs and he/she spends probably 15-minutes inspecting each master disc under a microscope to assure it’s properly cut.

The two master discs are shipped or hand carried to the production facility. While the lacquer masters and your finished record are environmentally safe, what goes on in the manufacturing facility is considered hazardous – at least in getting our project to the record pressing press. It’s possible to get from the master discs to the record presses in a single 8-hour shift. The entire workflow is called the Matrix Process.

Our masters are first coated with metal. A silver nitrate solution coming from two chemical solutions through a two-headed spray gun adheres to the lacquer surface as it is slowly spun inside a spray booth.

Through a metal electro-plating process which uses a nasty bath of acid a negative nickel disc is created. This disc is referred to as a metal master or father and has ridges in place of grooves. This process typically takes up to about 3-hours. Separating the father from the master is difficult and any misstep can destroy the father. The lacquer master is no longer usable and is recycled. The father can be used as a stamper in a “one-step” production process but since the number of records that can be pressed from a single stamper is limited, the father is usually cloned numerous times via two more plating processes.

The next toxic electro-plating process produces a positive disc. This disc has grooves and is playable. It’s called a mother and is frequently played as an interim quality control check. Mothers may be stored for producing additional stampers at a later date.
The plating process is repeated to make a new negative from the mother called a stamper. Several stampers may be plated from one mother thereby vastly increasing the quantity of records that may be pressed from a single master. Records are pressed from a puck of molten vinyl between the two stampers which are heated by steam and then cooled by water. The pressing cycle takes the better part of a minute. Labels are pressed into the records and the flashing is trimmed after pressing.

A single-pair of stampers (sides A & B) can press up to about a thousand records but the quality does deteriorate slightly with each pressing. Some audiophile records may limit the number of pressings per stamper to only a hundred for optimum fidelity.

Direct Metal Mastering (DMM) cuts the record into soft copper instead of lacquer and creates a whole different set of problems to the mastering process.

So that’s how a vinyl record gets made from a master disc. In the golden days of vinyl, there were many mastering and manufacturing facilities. Then along came the compact disc and record production dwindled and along with it so did the number of facilities.

Background players included the many companies that manufactured the vinyl used to press the records and the lacquer masters used to cut the master discs as well at the special cutting styli that had a limited life of only a few masters. The vinyl industry found production dwindling with environmental regulations increasing. I’m not sure if there is any vinyl compound suitable for records made in the U.S. any longer. Asia is now the prime source of our vinyl and much environmental pollution.

The source of lacquer masters also dwindled through attrition and closures leaving primarily a single domestic source – that being Apollo Masters Corp. in Banning California (on I-10 near Palm Springs). Apollo also makes the special cutting styli used in mastering.

Unfortunately Apollo was devastated by an all-consuming fire on February 8th, 2020. Fortunately, no employees were injured. We don’t know many details at this time but are assured of a big interruption in the supply of lacquer masters needed for creating new vinyl records as Apollo had 75% of world market. The existing supply of mothers and stampers will provide a continuing source of currently released records for some months. It is unknown how many lacquer masters ($900 for a box of 25, enough for 12.5 records), are in storage at various mastering facilities, but most assuredly the creation of new records is going to be drastically reduced if not stopped in the very near future.

Apollo may decide to quit the business at this time. MDC in Japan has 25% of the market and is running at maximum capacity and not accepting new orders. The future of the industry is now clouded in smoke.

I’ll provide updates separately as news becomes available.

Further reading:


https://en.wikipedia.org/wiki/Phonograph_record