

Mr. James Tempelis  
Minnesota Mining & Manufacturing Company  
Medford, Oregon

I would like to preface my talk by stating that this subject is so current and active that what I am telling you today will probably be changed and improved upon by tomorrow. At the same time, new factors will be introduced as far as equipment and products are concerned that will cause important changes by years end. We believe that what we are saying today is an accurate indicator of where we think the subject will be moving in the very near future.

As many of you have already heard, coated abrasives are again making history in the wood industry. I can confirm personally that an abrasive planer is, indeed, not only a reality but a success. This particular mill has certainly given us a hint of the next step forward in the dimensioning of lumber. However, before going into the details of this latest development, let me review a bit to where abrasive planing began and the necessary developments which made it all possible.

It is only necessary for us to go back as far as the post-war days when the coated abrasive industry realized that they had to make new improvements in order to satisfy the many demands coming its way. It was really during these years that the coated abrasive industry and the abrasive machinery industry began to research and innovate. By much experimentation and modifications to their products this industry evolved to its present status, which is an integral part of the technological and economic growth of this country.

To be more specific, we learned early that in order to remove heavy amounts of stock, whether metal or wood, coated abrasives needed a solid, rigid support driven with a tremendous amount of horsepower. Three to five horsepower

per inch of belt width is not unusual.

Certainly, the already available natural minerals, soft backings and soft bonding agents were inadequate. Therefore, to realize a dream, the coated abrasive industry's ingenuity had to go to work. They developed backings that were firm and tear-resistant; bonding materials that were made from thermo-setting resins; and synthetic minerals that would withstand tremendous amounts of impact. By combining these three ingredients in the proper balances, a new era in coated abrasives was actually born. The limits of "sandpaper" were quickly fading into the past.

While this evolution was going on in the coated abrasive industry, progress was also being made in the machinery field. The abrasive machinery people were not only refining their machines, but they too were researching more fertile fields.

#### Where It All Started

The beginning of abrasive planing actually took place in the Pacific Northwest. First, came the single-head sanders for the fir plywood industry. The purpose of these were merely to supplement the drum sanders by sanding the resand and improving the finished product. Shortly after this, in the early sixties, the multiple belt sanders were introduced. These were to replace the drum sanders. These sanders were the first to contain the high-horsepower motors and the aggressive contact rolls. The advantages were obvious -- not only was the fir plywood industry able to improve the appearance of their product, but they increased their production capacity dramatically. To give you some examples, the drum sanders maximum speeds were in the realm of 22 - 30 feet per minute, utilizing eight abrasive heads. The new belt sanders contained four to six heads and their full speeds can run from 150' to over 300' per minute. Where it took three shifts and many men to sand out a mill's production, now in most cases it takes only one shift or less. The true potential of coated abrasives had begun to be realized.

Not long after this, the particle board industry made their needs known. In most cases they not only demanded a much more superior finish than the plywood industry, but it was essential to plane a much denser material in much more substantial amounts. In structural plywood, we were removing .040 to .065 total stock from wood measuring approximately 32-lb. density. In particle board, we were asked to remove .065 to .200 plus total, and the densities ran 45 lb. - 55 lb. As you can see, the demands were substantial but were met after much research and experimentation. At present, the particle board plants in this country are planing and finishing these dense boards in one pass at speeds from 100' per minute up to 200' per minute utilizing only six abrasive heads. Admittedly, the horsepower consumed is sizeable, but the ultimate results are extremely practical. By allowing this industry to hold thickness tolerances of plus or minus .002 and to attain high-quality finishes, we helped them enter markets never before attempted.

It was not until these demands were met that the coated abrasive industry and the abrasive machinery people knew they had the tools they needed to get into the planing market. Thus, the abrasive planing era was born.

Before proceeding, let us clarify the term abrasive planing. The woodworking industry defines it as the process capable of dimensioning, leveling and smoothing precisely flat stock. This would include any species of wood or reconstituted wood.

The furniture industry was our next step. Prior to the sixties, it was no secret that this industry was in need of some technological assistance. They were a typical example of the wood industry. They were living in an extremely competitive market and suffering from escalating labor and material costs.

Up to this time, this industry was utilizing knives in their planing department. Because of these knives, they were living with slow production speeds and frequent down time for knife sharpening. The labor costs were exorbitant. As this industry tried to improve the speed and efficiency of these knife planers, the situation grew even worse. The downgrade increased. They were living with a reject rate on edge-glued lumber of 5%, a reject rate of 15% on banded particle board and a reject rate up to 25% on dimensioning solid lumber. I don't mean to paint a dismal picture, but as you can see the demand for an improvement was there.

In 1962, the 3M Company introduced the abrasive planing concept to this industry. As predicted, it was highly successful. Immediately it enabled the furniture industry to cut labor costs, and virtually eliminate downgrade, not to

mention the substantial increase in production. It was no surprise that within seven years there were more than 100 new installations sold to this industry, excluding the heavy-duty machines in structural plywood and particle board plants. To this date, two years later, there is estimated to be over 200 abrasive planing installations.

One of the more recent developments in the abrasive planing field has been the dimensioning of laminated beams and arches. The first abrasive planer for this purpose was installed in the Bohemia Lumber Company's laminated beam plant located near Cottage Grove, Oregon. This installation has been running now for over a year and the results have been very successful.

The process entails dual planing. First, the individual laminations must be planed, and then the glued-up pieces must be planed to level the surface and remove the adhesive which has been extruded in the laminated process. The abrasive planer used in this latter system is merely a two head opposed system, utilizing up to 75" wide belts and powered by two 200 h.p. motors. This abrasive planer often removes on 6' wide material a 1/2" of stock in just one pass at 25' per minute. This is truly abrasive planing at its ultimate!

To this date, this has been the only abrasive planer sold for this type of operation. However, we are confident that there will be more growth in this industry soon.

#### The Abrasive Industry's Next Challenge

This brings us up to the present and to the abrasive industry's next challenge and my main topic.

#### Abrasive Planing of Softwood Lumber

I must preface my subject by admitting that abrasive planing was not practical for this lumber industry until the advent of precision sawing with the new narrow kerf saws. However, now that it is becoming economically imperative to reduce waste and maximize yield, abrasives should be a natural. The advantage of coated abrasives is that they are much more versatile than knives. Not only can they remove heavy amounts of wood, but they can also take very light cuts without injuring the grain. In fact, the lighter the cut the better coated abrasives perform. They will not tear out soft grain or chip out knots, but rather upgrade in most cases. On the other hand, knives excel only when there are heavy cuts to be taken. Injury to grain and knot areas results in downgrade as the stock removal requirements decrease. Therefore, to fully utilize precision sawing to its maximum, abrasive planing should be utilized. A machinery manufacturer boasts of increasing yield from timber as much as 15 - 20% with his narrow kerf system. Supplement this system, or any other precision-sawing system, with an abrasive planer and it is possible to cut the downgrade another 15 - 20%. The additional benefits are obvious. To saw close and be certain that you will hold your grade from the cant to the car nearly one hundred per cent of the time is a benefit that cannot be overemphasized. Another advantage is to upgrade, whether it is clear, standard or shop grade, in order to assure you of receiving the maximum return in dollars.

#### Two Types of Systems Available

The types of systems needed to satisfy the lumber industry are twofold. They are categorized as the Batch System and the In-Line System.

The Batch System involves a dual line which includes a pair of two-headed edge sanders, two accumulating lines and a four to six head wide belt sander 52" wide similar to a plywood or particle board sander. The system operates as follows: The boards are first passed one at a time through the edge sanders. Next they fall into the accumulators which align the pieces for entry into the wide belt machine sanding up to thirteen 2x4's at one time. If the stock removal is realistic, the feed rate possibility of the wide belt sander will be at least 100' per minute. This calculates to 1300' per minute, which is certainly adequate.

The In-Line System is just as it denotes. It entails sanding the top, bottom and two sides, one board at a time. Thus, it would be the natural system which would allow anyone to convert the already existing planing mills. In other words, you could install the abrasive planer in the area where the knife planer presently sits.

We also realize that this system would require speeds from 500' to 900' per minute to be practical. At this time, it should be pointed out that these speeds are attainable with coated abrasives. Not only can we produce a quality finish, but we can also maintain precise dimensioning regardless of the stock removal demands.

Two other questions I would like to answer before concluding are: Types and grits of abrasives recommended and estimated belt costs.

The answer to the first question is that we recommend a cloth-backed, open-coated, aluminum oxide belt bonded with a thermo-setting resin. It is this type of product that can best take the tremendous impact generated by this process. The grit sequence which has thus far been the best is a 24 grit for the cutting heads and 50 grit for the finish heads. This is, of course, optional.

The question of belt costs is a relative one. It is dependent on many factors, such as the type of wood species run, the moisture content and amount of stock needed to be removed. We can predict that on dry lumber the sanding costs would be similar to those in the plywood and particle board industries. That is approximately \$.15 to \$.40 per thousand surface footage sanded on boards running from .062 to .125 plus or minus. This cost only includes the faces sanded. The sanding costs of wet lumber will be higher, but it is worth noting that if you can surface dry even the wettest boards, costs will go down proportionately.

It should also be noted that abrasive planing requires six times as much power as does knife planing. This factor should also be included into a cost factor.

As new demands of the lumber industries grow, new systems must be used. Upgrading and better wood utilization are no longer demands for the future because the future is here. In order to survive, new methods must be employed now. Precision sawing is a part answer. We feel abrasive planing completes that answer. Moreover, whatever limitations abrasive planing has now, you can be assured that the developers of both coated abrasives and abrasive-planing machines will be working to eliminate them.