

A Convers

Vaughn Marker is a former Asphalt Institute Chief Engineer. Vaughn shares some of his experiences with *Asphalt Magazine*. His experience spans the road mix era and continues into the modern Hot Mix Asphalt era.

Editor, *Asphalt Magazine*:

How did you get started in the asphalt business?

Vaughn Marker:

After thirty-nine months in the service during World War II, the California Highway Department (later CALTRANS) talked me into coming to work for them on a construction survey crew. I had one year of college left and I went back and got my engineering degree. I met my wife in college and there was a Caltrans District IX office in her hometown of Bishop, California, so we moved there.

After about three months of getting indoctrinated, I was sent out as an inspector on an asphalt paving job. That was the beginning of my career in asphalt and it took me about three days to make a big mistake. It was on a job in the Mojave Desert. We had a sandy mix and a soft asphalt, so the mix was tender. The contractor had an Adnun paver that was essentially a spreader box with wheels in the front and rollers in the back. The rollers rode on the mix being placed, propelled the paver, and at the same time compacted the mix.

The Resident Engineer told me that the contractor should pave in one direction and when he got to the end of the pass, bring the paver back, and pave in the same direction for the next pass. The contractor wanted to just turn the paver around and come back the other way, thus saving dead-head

time. That seemed OK to me so I let him do it. The problem was, the first pass was in the downhill direction, but it was uphill the other way. Since the traction of the paver was through the rollers in the back, riding on a hot, tender mix, the paver just couldn't do it. It was August in the Mojave and the temperature was 110 in the shade and we didn't have any shade. The sand mix with the soft asphalt was not stable enough. The paver just kept digging into the mix. That was why the Resident Engineer had told me to pave downhill. It was a disaster. We had to rip the whole thing up with a blade and lay it back down again. That was the first job I had been on and it was my first big mistake. But I learned from it and didn't make that one again.

Editor:

What happened after that?

Vaughn Marker:

I went on to become a Resident Engineer with Caltrans. At first, I did a lot of what we called "squirt and splatter" jobs. It was actually a penetration treatment. You put down a granular material, compacted it and then sprayed a cutback asphalt over the surface and allowed it to penetrate. Then came road mix jobs where asphalt was added to a sized-windrow of granular material, mixed in place, spread with a blade, and compacted. After working for a while as a Resident Engineer, Caltrans tapped me as a Field



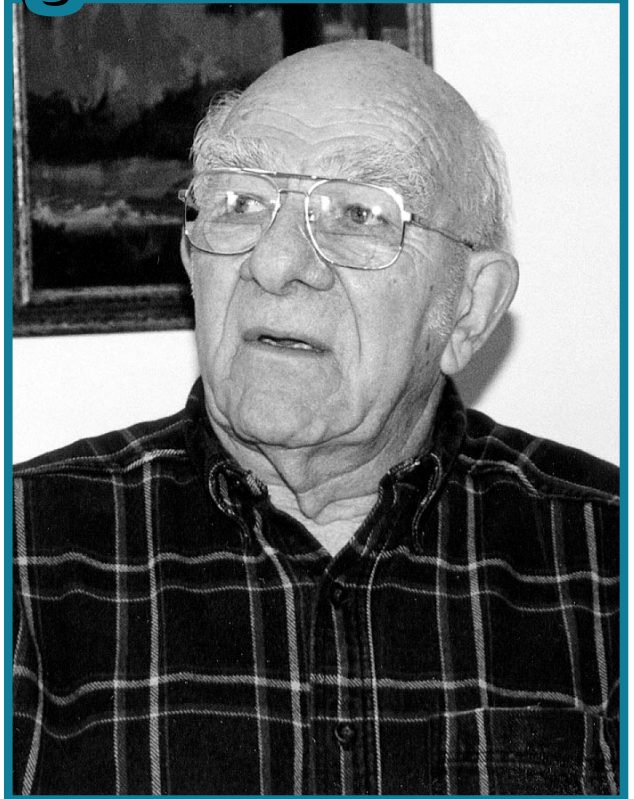
Paving in the 1930's



Mixed In-Place Bituminous Surface

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with Vaughn Marker



Man in the Headquarters Construction Department in Sacramento. A Field Man's job—there were three of us in the state—was to visit every project in his third of the state at least once a month to make sure everything was going properly, that the funds for the project were not being overrun, and that the specifications were being met. That was a good job, but then the Korean War came along and I was recalled into the service for another 27 months. When I got back, Caltrans gave me my job back but someone else had the Field Man position. So I sat around for a couple of weeks, then the boss called me in and told me he wanted me to look into a couple of asphalt projects that had failed shortly after completion. He told me to go out and find out what happened.

That was the beginning of my field research and project trouble-shooting. For the next three years all I did was go on asphalt projects around California. I climbed all over and personally inventoried about 175 hot mix plants. I crawled inside, took covers off the screen decks and the whole nine yards. I looked for some literature about the equipment and the problems one could expect under different conditions. I soon found out there wasn't any. I also learned you can't learn anything about asphalt plants by looking at the plant from the outside. You've got to look on the inside of the plant and inside of the equipment if you want to find out what is going on.

Editor:

What did you find out?

Vaughn Marker:

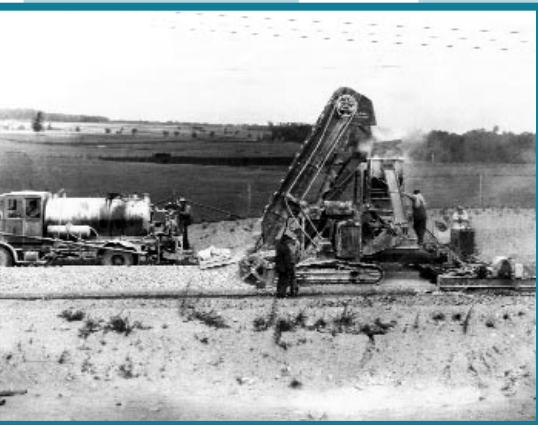
Well, I learned a lot just climbing around those plants. I learned little things like what would happen if you had a bin with square corners and heated aggregate. The number one bin was always the problem. It is the fine aggregate bin. One particular problem was that the static electricity accumulated on the fine dust particles that were floating around. The particles grab onto the walls, and if there is a square corner they build up a wedge in that corner. Then if you draw the bin down too far, the wedge loses support at the bottom and will fall in. Then all of a sudden you get a dust slide and your mix is bone dry. There isn't enough asphalt to coat the mix. But you can't see that from the outside, you have to crawl inside the bin to see what is happening.

We eventually worked out a deal with the plant manufacturers to put fillet plates in the corners where there were 90-degree angles. We ended up with two 45-degree angles instead of the 90-degree angle. I spent a good amount of time working with the two manufacturers of asphalt plants in California—Standard Steel Corporation and Madsen Ironworks.

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Barber Green "Mobile Automatic Mixer"



Paving in the 1930's



1950's Barber-Greene Paver. Former Asphalt Institute Headquarters, College Park, Maryland, is in the background.

Editor:

Did you pass on the information?

Vaughn Marker:

Oh, yes. I got all sorts of information—pictures of the plants being fabricated, and color slides of drawings showing how various plant components functioned. I used them in training sessions for Caltrans inspectors. Many of the slides became part of the Asphalt Institute literature. My work for Caltrans lasted almost 9 1/2 years. Then the Asphalt Institute hired me and I started doing all sorts of things for them. But I learned things in the field climbing around those hot mix plants that you couldn't find in a book. I found answers to everyday practical problems in the field.

Editor:

How about an example?

Vaughn Marker:

In those days we didn't have air blowers and burners to atomize the fuel oil and introduce heat to the dryer drum. We had high pressure steam burners to do this, and this pressure produced the draft through the dryer drum. One of the things we learned was, that when you set up your plant, to make sure the dryer was set so that the prevailing wind was blowing into the fire-box-end of the drum. The wind helped the draft. We eventually got cyclone dust collectors with suction fans that collected the dust and created the draft through the dryer. We got rid of the steam, because it was not only inefficient, but it put moisture into the dryer that you had to drive out with the heat. Next came wet scrubbers to trap the dust the cyclone didn't catch. These were the things that were developed fifty years ago.

Let me tell you something about electronic screed controls. They were an adaptation of what a contractor named Shea dreamed up for motor graders while he was lying in the hospital after he got hurt on a job in the Mojave Desert. He had put his system on a Cat 12 motor grader. He put a pendulum in an oil bath and zeroed it to the blade set at the tilt (slope) he wanted. If the slope went off on the blade, the pendulum moved. And if the pendulum moved, a signal was sent to bring the blade back to the correct slope. This system was adapted to the paving machine and the Barber-Greene Company started putting it on their pavers. Shea came and talked to me about the system and how it could be marketed. Barber-Greene bought the idea and from it evolved the electronic screed controls.

Editor:

Vaughn, how did you get started with the Asphalt Institute?

Vaughn Marker:

Barney Vallerga hired me. I started out as a District Engineer, then moved to Paving Engineer, then to Division Managing Engineer, and finally to Chief Engineer of the Institute. I became Chief Engineer in 1973 and was in that position until I retired in 1983.

Editor:

What were some of the technical issues when the Institute hired you?

Vaughn Marker:

A big problem we were having in those days was smoothness. We weren't so worried about density at that time. You still had to get compaction, but smoothness was the problem.

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with Vaughn Marker

Editor:

What do you mean?

Vaughn Marker:

Well, there are three kinds of smoothness—back then and now. You have gradeline smoothness, there is short-span smoothness (sags, bumps, and hollows), and you have texture smoothness. Three different kinds. You have to deal with each one in a different manner. Now gradeline smoothness had to come from the subgrade or from the pavement you were overlaying. That is the first thing you had to get right. Barber-Greene took care of the sags and hollows when they came along with the floating screed, if they weren't more than half again the length of the paver. The paver had to be used properly, however, to give the proper results. These were the concerns at the time—during the late 1940s and early 1950s. We gradually figured out what we had to do to get what we needed.

When I retired from the Institute in the mid-1980s, I became a consultant partly because folks were calling me to help them on paving projects. I would go out there and get the same questions that I had been trying to resolve thirty years earlier. The principles were the same; the solutions were the same.

Editor:

Vaughn, what were some of the solutions?

Vaughn Marker:

Let's take gradeline smoothness. It has to be built into the subgrade. You make sure that the subgrade is built to

the plane you want and to the elevation you want. Then you apply a uniform surface thickness. But it doesn't always work. Let me give you an example. A well-known agency has a habit on an airfield pavement of specifying a degree of smoothness and the grade at a certain fixed elevation. Then they say that you have to have a uniform pavement thickness. And that thickness at the elevation has to be exact. Okay? Now if you have a slight irregularity in the subgrade and you want the top to be smooth and at a fixed elevation, then you are going to have a variation in thickness. Something has to give. They insist on meeting all three requirements precisely and that can't happen. You see the dilemma. This problem is sometimes a little greater when placing an overlay on an existing pavement. The basic problem is in the specifications.

Editor:

What other field innovations have you seen?

Vaughn Marker:

Many think that the use of surge bins began in the late 1960s, but they were in use years before that. In 1946 or '48, the contractor put a surge bin on a continuous mix plant working in the Mojave Desert because he was a little short on trucks. As you know, continuous plants run all the time whether there is a truck there or not. So he figured out that he better have a place to store some mix without having to stop the plant. The bin would hold, I think, 20 to 25 tons. It wasn't a big one and it was square. We were loading trucks out of that bin almost 20 years before the common use of surge bins.



Late 1950's Multi-Lane Pavement



1950's ERA Batch Plant



Paving in the 1950's

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Editor:

What kind of production were you getting from that plant?

Vaughn Marker:

It was small—120 to 150 tons per hour. But even with that kind of production, it makes a big difference when you are starting and stopping with a continuous plant. Stopping and starting isn't that easy. It's a lot easier to stop and start with a batch plant. You can control the timing with a batch plant. But with a continuous plant, it's either got to be running or it's got to be stopped. And once you stop it, it's more difficult to get it back going and in balance again.

Editor:

Who were some of the interesting characters you worked with?

Vaughn Marker:

We had a guy in California, for whom I had the greatest respect, named Francis Hveem. His brain worked like one of those old Rube Goldberg cartoons. He could visualize tests for specific needs and put together mechanically anything he dreamed up. He developed the Sand Equivalent test. He developed the Field Extraction Test, which was a reflux extraction procedure for work in the field. You could carry it in your car and make a reflux extraction on the job. Hveem also had a very big part in the development of the kneading compactor. He was a remarkable guy.

Editor:

Tell me about your involvement with open-graded friction courses (OGFC).

Vaughn Marker:

Since the mid-1980s the industry has

developed advanced pavement materials, including open-graded friction courses. What many people don't know is that we put down our first open-graded mix in California in about 1951. The reason we put it down was because we used to put down chipseals on top of our finished pavement. As traffic volumes and speeds increased, we were getting more and more complaints from the motorists about flying chips hitting their windshields and cracking them. So one of the Caltrans District Engineers on a visit back East saw where Virginia had been playing around with what was called a "Virginia Mix." It was, in essence, an open-graded mix, but it was a little different than what we eventually came up with in California.

Our Caltrans District Engineer came back with the open-graded idea and Wentworth Lovering (then with Caltrans and later with The Asphalt Institute) developed the mix design for it. We took the 3/8-inch chips that we used for the sealcoats, put them through a pugmill with asphalt, then specified a minimum laydown thickness that was twice the size of the rock. When we placed the mix, it was open and was very effective.

Of course, the purpose of the open-graded mix, as well as the seal coat, was to seal the surface. We got a little drain-down of the asphalt from the mix, but the main thing we found out was that we didn't lose any chips. There weren't any more chips flying around. And all of a sudden, we weren't getting any tire splash during a rainstorm from the vehicle in front of us.

Editor:

So the success of this experimental open-graded mix was really unintentional?



Circa 1950 Asphalt Surface Treatment

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Vaughn Marker:

It produced benefits that we hadn't planned on. The next thing we found out about it was that it was the quietest ride we had ever experienced. It was just quiet. And the third thing we found out was we could easily see the white traffic stripe in a rainstorm. At the same time we found out that because there was no water standing on the asphalt surface, there was no hydroplaning.

Editor:

What year was that?

Vaughn Marker:

It was around 1951, long before OGFC was generally acclaimed. We didn't have any preconceived design, we just used the material—the chips—that we had and developed a special design. We called it “open-graded mix.” Later, when I was with the Institute, we produced a booklet, *Designing Open-Graded Friction Courses*.

We found out when using the open-graded mix, that we got some asphalt drain-down. But not that much. We found out real quick that we had to use a harder grade of asphalt and had to mix it at lower temperatures. Otherwise, you had all the asphalt in the bottom of your truck when you got to the job. We ended up using pretty close to six percent asphalt cement in the mix and ran it at pretty close to 250°F mix temperature.

I learned a lot paving California roads. My initial experiences were mainly penetration-type treatments and road mixes. In my younger days in California we did an awful lot of road mixing—mainly on secondary roads. But as time went on, we started putting hot mix on the main roads and

used the road mix only for the lower-volume roads. The road mix was cheaper.

I remember talking with the manufacturers of a leading road mixing machine at the time, Walter Madsen and his dad. They told me they had to reach a policy decision on whether to continue manufacturing road mixers or concentrate on manufacturing hot mix plants. Their conclusion was that the future of asphalt was going to be in hot mix and not in road mix. I guess I had that conversation with the Madsens around 1949 or '50. It was before I came with the Institute.

The Madsens had a real good road mixer, but looking down the road, they concluded that hot mix was going to dominate. So they shied away from manufacturing road mixers and concentrated on developing and manufacturing hot mix plants. To this day I think they had the best hot mix plant that I have seen anywhere.

Editor:

Why do you think the Madsens and others went hot mix rather than road mix?

Vaughn Marker:

I think there were several things involved. One was the quality of the mix. It was better and provided greater strength. You had better control of the mix, and mixes were beginning to go in the direction of a more scientific approach. ▲

Editor's Note: The next article in this series will feature the experiences of an Asphalt Institute engineer whose work covered the early days of HMA.



Madsen Batch Plant Circa 1960



New Jersey Turnpike Circa 1960