

## CASE STUDY

# High-Tech, Space-Age Metal Surface Enhancement Coating Solves Wear and Release Problems for Pine Instrument Company's Gyrotory Compaction Asphalt Testers

*By Corey Wesnitzer, General Magnaplate Corp.*

The development of computer-controlled asphalt testing equipment to simulate and then quantify and predict the punishment which various asphalt mixes will be able to endure when used to pave actual roads has placed enormous burdens on the components of that test equipment. To stand up to simulations of heavy road wear, equipment designers have had to look beyond the conventional and to seek out materials that could endure tremendous stress. That was precisely the position in which the worldwide, leading supplier of such equipment, Pine Instrument Company of Grove City, Pennsylvania, found itself.

Research has shown that the best way to simulate the long term effect of traffic is to use what is known as the "gyrotory compaction method." In this procedure, the asphalt aggregate to be tested is placed in an enclosed compaction chamber or enclosure in which it is subjected to various forces. In this situation, acceptable performance not only meant that the equipment would

withstand these forces for long periods of time, but also that the asphalt would be released quickly, easily, and completely from the compaction chamber following each test.

When Pine Instrument began development of its new state-of-the-art tester, the SUPERPAVET AFGC 125, Pine's engineers knew that the demands on the equipment would be enormous. Operators would have the option of compacting to a specified height or to a specified number of revolutions of the chamber. The completely enclosed chamber was designed to eliminate pinch points to assure optimally safe operation and features a self-aligning ram and mold assembly, a removable ram foot which allows either 100mm or 150mm specimens to be compacted, and a heavy-duty frame assembly that ensures that the tile angle of the mold will conform to specifications. At the bottom of the compaction chamber is a 1018 cold rolled steel platen that receives much of the loading force of the tested specimens.



Tomorrow's  
Materials  
Solutions...  
Today.



Tomorrow's  
Materials  
Solutions...  
Today.

When the Pine engineers were designing the 125X, the effective life and release performance of this platen were of major concern. To satisfy the demanding specification, Pine turned to General Magnaplate Corporation of Linden, NJ. Pine Instrument mechanical engineer Roger Pyle explains: "Not too far into the development process, we anticipated and then encountered problems with the platen. The loading of the chamber as well as the testing process subjects the steel to a lot of abrasion from the aggregates in the asphalt mix specimens," Pyle explained. "The specimens are full of stones and they would gouge the steel. In addition, the asphalt mix would slide against the platen under pressure, and we would get a galling effect. Moreover, we could see that as wear of the platen increased, it became increasingly difficult to release the specimens from the changer following testing cycles."

Pine had considered several options, from hardened steel to the use of other alloys and metals. But early in their testing they discovered that the coating General Magnaplate applied to sample platens - PLASMADIZE® NWG - was superior to the other options.

### **"Synergistic PLASMADIZE Technology Excels**

For several years, thermal spray coatings have been widely recognized across a broad spectrum of industries for their ability to protect all types of new metal parts on most packaging, processing, printing, converting, and other manufacturing equipment. They are also well known for their ability to restore worn parts and components. Unlike conventional single-component thermal

spray coatings, which are extremely brittle, PLASMADIZE coatings are true composites, composed of a matrix of high-tech materials which include metals, ceramics, polymers and/or dry lubricants.

These components are applied either simultaneously or in as many as three sequential process steps. The high-tech matrix technology enhances wear resistance by virtually eliminating shear fracture, the prime cause of wear. Wear resistance of PLASMADIZE is superior to nickel or hard chrome plating. Polymers and dry lubricants combine synergistically to make the coating self-lubricating and impart excellent non-stick release properties; after burnishing, PLASMADIZE NWG has an extremely low coefficient of friction. In addition, the coating is corrosion-and oxidation-resistant at temperatures up to 1300°F.

Because the resultant surface is superior in performance to both the base metal and to the individual components of the coating, these General Magnaplate applied, enhanced plasma sprayed coatings are called "synergistic."

The synergistic solution offered by General Magnaplate PLASMADIZE NWG has provided the answer for Pine Instruments as more and more of their SUPERPAVET; AFGC 125X Gyrotory Compactors are installed in the field. "Today, our own tests and real world experience show excellent wear characteristics and great lubricity for the compaction chamber's cold rolled steel platens," reports Pyle.

### **Exactng Standards of Quality**

Since 1962, Pine Instrument has served



Tomorrow's  
Materials  
Solutions...  
Today.

the asphalt paving industry as a designer and manufacturer of testing equipment. Throughout more than three decades, its equipment has been created and produced to demanding standards. The AFGC 125 X Gyrotory Compactor is truly a state-of-the-art development that includes an integrated industrial computer that manages all functions.

To operate, all the tester must do is enter the desired compacting parameters on the control panel, deposit the prepared mold into

the compaction chamber, and press "start." The computer does the rest. PINEPAVE, user-friendly PC-based software supplied with the 125X assists the technician with data retrieval and performs volumetric calculations. Results are displayed graphically by means of a graphical user interface that obtains compaction data and presents.

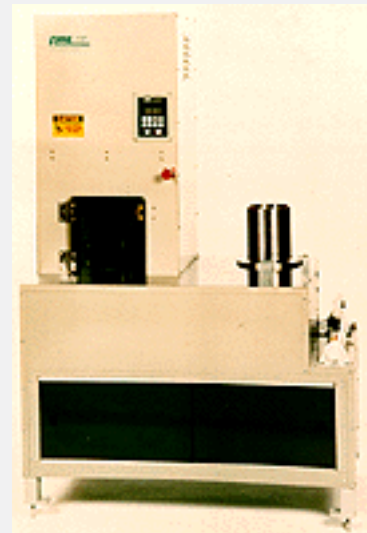
### Background Data

#### Space Age Coating Technology Brought Back To Earth

Founded in 1952, General Magnaplate has an unparalleled record in coating aerospace and aviation metals for reliable performance, even in the rigors of space. Every NASA space mission since the beginning of that agency has had thousands of Magnaplate-enhanced parts. And at surface enhancement Technology Centers in New Jersey, Texas, California, Wisconsin, Canada and at licensees around the world, Magnaplate coatings are utilized on metal surfaces used in just about any application imaginable.

Wherever metal parts are used, design engineers and metal finishers are looking for better ways to resist such things as wear, abrasion, corrosion and chemical attack, as well as ways to provide dry lubrication, dielectric strength, hardness, conductivity, mold release, and many other performance characteristics. Magnaplate's second-generation "synergistic" thermal

spray coatings are often the key to success, whether the challenges are found in space, or in down-to-earth manufacturing plants like those of Pine Instruments.



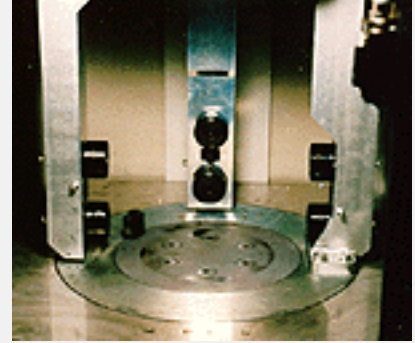
When using Pine's new SUPERPAVE AFGC 125X Gyrotory Compactor, operators have the option of compacting to a specified height or to a specified number of revolutions



Tomorrow's  
Materials  
Solutions...  
Today.

of the chamber. The completely enclosed chamber is designed to eliminate pinch points to assure optimally safe operation. It features a self-aligning ram and mold assembly, a removable ram foot which allows either 100mm or 150mm specimens to be compacted, and a heavy-duty frame assembly that ensures that the tilt angle of the mold will conform to specifications.

At the bottom of the compaction chamber is this 1018 cold rolled steel platen designed to receive much of the loading force of the tested specimens. The wear life this platen was of major concern, so engineers had the platens coated with PLASMADIZE NWG, a



thermal spray surface enhancement coating applied by General Magnaplate Corporation, of Linden, New Jersey. The coated platens exhibit excellent wear resistance and anti-galling properties.