Performance Alloys Corp.

June 20, 2006

Mr. John White
American Piledriving Equipment, Inc.
7032 South 196th
Kent, WA 98032

Dear Mr. White:

It was a pleasure speaking with you this morning. As per your advice I have sent literature to your regional offices in New Jersey, Florida, California, Texas and Virginia.

Following our discussion we manufacture and sell to foundation, geotechnical and environmental drillers our premier line of hardfacing electrodes, rod and wire.

We have designed our **HARDERN-HELLE CRC2** specifically for the drilling industry and our products have been field tested and proven time and time again to beat competitors not only in price but in the all important arena of wear resistance to extreme abrasion.

I have included some literature for you to look at and would be happy to arrange some samples of the product for you to try.

We also offer corporate discounts for companies like yourself with multiple locations.

Please let me know if you have any questions.

Best Regards,

Vanessa Salem

4025 Spencer Avenue, Unit 405 • Torrance, CA 90503 • Tel: (310) 371-8982 • Fax: (310) 371-1007

HARDERN·HELLE

High Performance Hardfacing

Designed for the Drilling Industry

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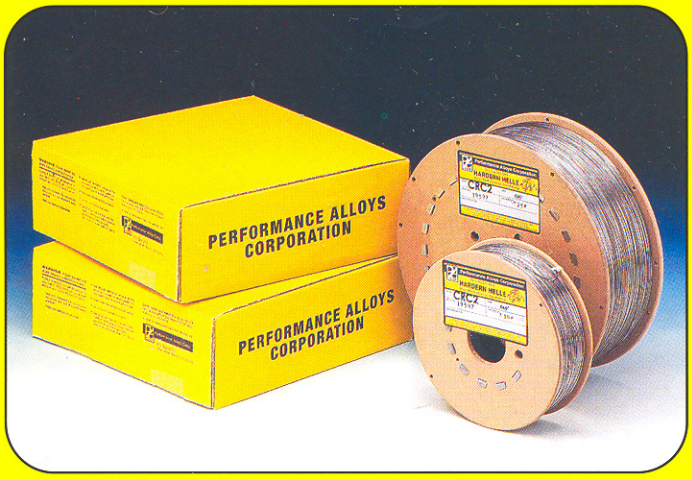
High Performance Hardfacing

Designed for the Drilling Industry

HARDERN·HELLE High Performance Hardfacing

HARDERN-HELLE CRC2 ELECTRODE

A high chrome alloy that produces the ultimate in carbide formations which outwears conventional hardfacing eletrodes. Exceptional abrasion and impact resistance on carbon, low alloy and manganese steels. Chrome carbide deposits develop a high polish. A uniform coating assures low temperature fusion with a minimum of base metal dilutions. This results in a consistent 60-63 Rc hardness



HARDERN-HELLE CRC2 OPEN ARC WIRE

Complex chrome carbides with the addition of Boron to add toughness. Develops an even cross checking pattern ideal for severe earth abrasion. Can be applied without shielding gas but use of CO2 will enhance out of position work. Generally 1 limited to two layers. 58-60 Rc hardness

HARDERN-HELLE WC2 ELECTRODE

Tungsten carbide particles within a unique shock resistant matrix provides the ultimate in severe wear resistance.

HARDERN-HELLE WC2 BARE ROD

Tungsten carbide particles in a tube designed for oxy-acetylene application. A wide range of mesh sizes available i.e. 8-10, 30-40, 80-200.

FOR ORDERING AND TECHNICAL ASSISTANCE

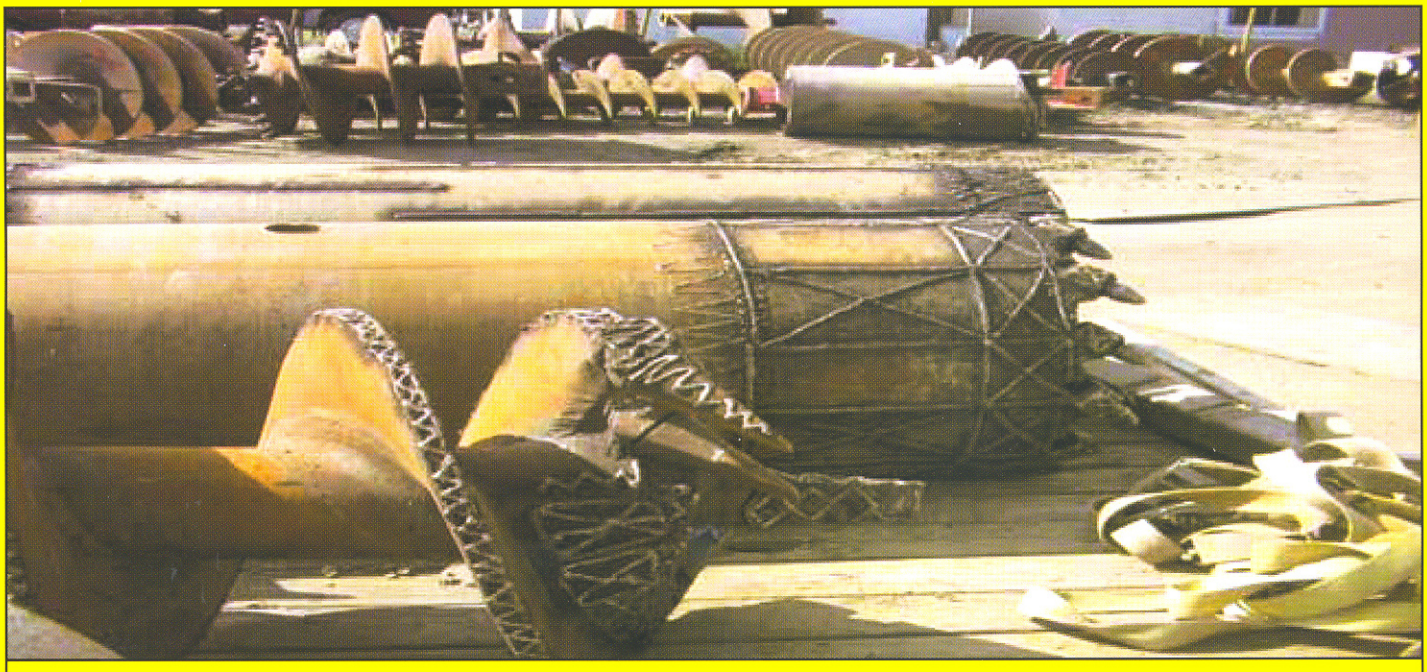
WELDING PROCEDURES	PACKAGE
Can be applied AC or DC either polarity (reverse preferred). Use straight polarity to increase deposition rate. Can be applied in stringer or weave beads. A two layer deposit should be made to assure proper chemistry for best wear results. Deposits are not machinable. 1/8" 110-140 amps 3/16" 120-160 amps 5/32" 120-150 amps 1/4" 140-179 amps	10 lbs. box (any diameter)
	40 lbs. box (any diameter)
WELDING PROCEDURES: DC reverse polarity recommended using either stringer or weave beads. Generally limited to two layers. Can be run out of position using relatively fast travel speeds and no oscillation. .045" 150-200 amps 22-26 volts .062 175-230 amps 24-28 volts	25 lbs. spool (.045")
	25 lbs. spool (.062")
WELDING PROCEDURES: Can be applied AC or DC reverse polarity. Use minimum amperage to minimize dilution. Use a stringer bead. Avoid multiple layers. 1/8" 80-100 amps 5/32" 100-120 amps 3/16" 110-130 amps	10 lbs. box (any diameter)
WELDING PROCEDURES: Adjust excess acetylene flame 3X length of inner cone. Use torch tip size larger than normal. Sweat deposits with minimum dilution. 1/8", 5/32", 3/16", 1/4"	10 lbs. box (any diameter)

CALL (310) 371-8982 MON-FRI 8:00 AM- 3:00 PM PST

HARDERN·HELLE

High Performance Hardfacing

Dramatically increase the service life of your drilling tools!



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www.hardern-helle.com

NATIONAL DRILLING ASSOCIATION

ADSC

national ground water association

CALIFORNIA GROUNDWATER ASSN CGA

HARDFACING OF CONVENTIONAL & HOLLOW-STEM AUGERS

(the benefits of high performance hardfacing)

FEATURING:

- **HARDERN-HELLE CRC2 (chrome carbide) ELECTRODES & WIRE**
- **WC2 (tungten carbide)**

- **What is Hardfacing?**

Hardfacing is a process whereby a wear-resistant surface is deposited on a metal component to increase longevity. Wherever abrasion, impact, heat and/or corrosion are prevalent, a part's wear-resistant capabilities are increased by hardfacing, and strength and longevity also are enhanced. Hardfacing maintains parts in better condition, while reducing replacement cost and downtime expense.

Other than critical maintenance on the rig itself, the most important cost-saving maintenance procedure for users of conventional flighted or hollow-stem augers is maintenance of the cutterhead and hardfacing on the auger flights.

- **Wear Determination**

A homemade ring gauge can help determine when hardfacing is required on the edges of the flights. The inside diameter of the gauge should be approximately equal to the original outside diameter of the new auger flights before hardfacing. This is not precision work, so gauges can be made with a fly cutter, from light sheet metal, heavy tin or any reasonably stiff material. The experienced operator usually can determine, by eye, when hardfacing on the flights should be renewed. Nevertheless, the use of a gauge is encouraged, particularly with personnel that lack experience. This basic ring gauge can be used to determine when hardfacing should be done and also as a try-gauge for overly worn flights that have to be built up prior to hardfacing. Also, it may also be useful to have a try-gauge for overly worn flights that have to be built up prior to hardfacing. Also, it may also be useful to have a try-gauge that is ¼ inch to 3/8 inch larger (on the diameter) than the basic ring gauge for use during the hardfacing operation. To some extent, this is dependent on the thickness of the deposition of the electrodes used.

If you have new or slightly used augers, it is not hard to determine the proper size for the basic ring gauge. If the augers have been used substantially, you will have to verify the original major diameter of the unhardfaced flights, and make you ring gauge based on the diameter can be more of a problem than it seems. Looking only at the normal size of 6 inches, Acker makes a 5 ½ inch, and Foremost-Mobile makes a 6 inch, while others make other sizes just for variety. If there is any doubt, find out the original diameter of the flights from the manufacturer.

- **Base Metal Characteristics**

Most auger flights are manufactured from mild steel. For example, the flights on a typical auger from Foremost-Mobile are made of hot-rolled, flat, AISI 1020 steel with a thickness of about ¼ inch. AISI 1020 is a general purpose, low-carbon (0.17-0.24%) mild steel. It is easily machinable and is weldable by any welding process. Some auger manufacturers use A-36 mild steel with a carbon content of about 0.29% or the very similar 44W mild steel with a carbon content of 0.22% to 0.23%. **HARDERN-HELLE CRC2** electrodes will properly fuse and bond to these steels. The procedures reviewed below should result in success for most mild steels with carbon content of less than 0.5%.

- **Wear Factors**

Reduction of the diameter of auger flights can be attributed to more than one type of wear. Generally speaking, most wear on the flight edges (usually in excess of 60%) can be attributed to two types of abrasion – high-stress grinding abrasion and gouging abrasion. Depending on the formations encountered, impact wear also can be a factor, although far less on the flights than on the cutterhead. High temperature also can contribute to flight wear if the cutterhead is worn to the point that it is cutting an under-gauge hole. Although not a major factor, the entire auger also is subjected to low-stress scratching abrasion.

Areas to be covered by the hardfacing material are, in order of importance: the edge of flight and the first half-inch of the upper face of the upper face of the flight. The area to be hardfaced will vary considerably depending on hardness and material of typical formations in your area. Due to some of the difficulties encountered while hardfacing the upper face, many are content with doing only the edge of the flight. Others do the edge of the flight with an occasional touchup on the face of the flight. Some do the entire upper surface of the leading flight of the lead auger. The most important thing will be actual observation of primary wear points in you typical formations with you specific augers.

- **Electrode Selection**

Electrode selection is extremely important. It is directly dependent on the base metal and the specific wear factors involved for the part being hardfaced.

If the amount of wear exceeds the amount that can be covered with two layers, **HARDERN-HELLE BU,** a special build-up electrode (with malleable deposition) should be considered. Two layers of hardfacing usually are adequate – and usually are maximum recommended.

HARDERN-HELLE CRC2 (chrome carbide)electrodes share approximately the same characteristics as **HARDERN-HELLE WC2 (tungsten carbide)** electrodes but are slightly less abrasion resistant and resist impact slightly better. **HARDERN-HELLE WC2** electrodes provide excellent protection against abrasive wear, but they lack resistance to impact and cost more that **CRC2** electrodes.

- **Preparation**

Remove all dirt, rust, paint, grease, oil or other contaminants before welding. Otherwise, it is and invitation to porosity and possible spalling. When using low-dilution, low-penetration hardfacing techniques, great care must be paid to cleanliness of the weld area to ensure proper fusion and bonding.

Prepare a sound foundation by removing fatigued and/or rolled-over metal. It should be removed by grinding and then built up to the proper profile, with **HARDERN-HELLE BU** electrode if the profile was substantially altered during the grinding process.

Prior to hardfacing, repair any cracks or damage and buildup any edges that are more than 1/8 inch (on the diameter) smaller than the basis ring gauge diameter

With **HARDERN-HELLE CRC2** electrodes, preheating is not necessary for augers fabricated of mild steel. If the carbon content of the base metal exceeds 0.30%, then preheating of the auger might be considered. The higher the carbon content, the higher the required preheat temperature. This is true to a lesser degree for the total content of other alloys.

- **Application of the Surfacing Electrode**

Position the auger horizontally at a comfortable height to enable welding to be done with a downhand motion.

With **HARDERN-HELLE CRC2**, to achieve maximum wear resistance, apply two layers of hardfacing. The first layer will produce an admixture with the base metal, and the second layer will produce a true wear-resistant surface. Three layers are sometimes acceptable, but four layers are almost always too many. A deposit of hardfacing alloy that is too thick can give more problems than no deposit.

Use a medium-long arc with either a straight pass or a weave. The arc should be somewhat longer than the diameter of the electrode. There must be no sticking to the puddle as this indicates a short arc. A hint of splattering should be all right. In many cases, a weave is preferable because, at low amperage, it causes less dilution of the deposit. With **HARDERN-HELLE** electrodes, the weave deposits a flatter bead that allows subsequent layers to be more evenly deposited. Do not run any pass longer than six inches, or one-quarter of the flight's circumference, whichever is less. After the first short pass on the first flight (without rotating the auger), do a similar pass on the next flight, and so on, until each flight has one short pass on it. To help force checking, chip each short pass, rotate the auger approximately 90 degrees and do the second short pass on each flight in the same manner. Make sure all subsequent passes are tied together properly. Repeat this until each flight has one full layer all around, and then start over again with the second layer. Thorough chipping and wire-brushing of each and every short pass is very important to minimize slag inclusion problems.

Weld as cold (low heat) as possible to prevent dilution of the hardface deposit by the base metal. In other words, use just enough amperage to maintain an arc. Leave an adequate deposit with settings as low as 80 amps to 120 amps for electrodes, 150 amps to 200 amps for .045" wire. Higher amperage equals higher deposition; lower amperage equals lower dilution of weld metal.

- **Planned Periodic Maintenance**

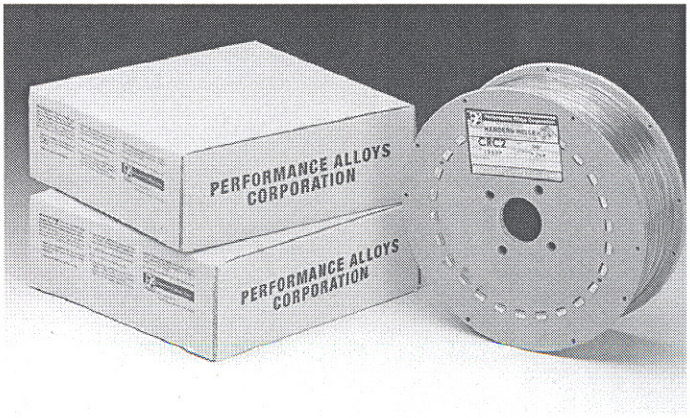
There are a number of different situations that will be encountered – the drilling contractor who has one set of augers, used very occasionally, to the contractor who has multiple auger rigs constantly in use. Remember that the cutterhead must be sharp and have the correct diameter in relation to the flights. If it is under gauge, abused, damaged or has dull inserts, then it will not do much good to worry about the augers.

Set up an auger maintenance and rotation schedule. The first down day of each month is a workable schedule for most; it is easy to remember and easy to implement. On the scheduled day, check the diameter, condition and wear on the cutterhead and the lead auger. Assuming the lead auger is not damaged or in really bad shape, hardface it with **HARDERN-HELLE CrC2 electrode or wire** and it is ready to go! The second month, hardface another auger, put the cutterhead on it and use it as the lead auger. Move the one you just took the cutterhead off of to the second position in the auger string and so on for a year. Try to do an extra one every time you have a slow period or an extra welder. Spend a little extra time to qualify another welder or two on the hardfacing process.

If you have more than an average number of augers, do one a week instead. Or, you have many augers and the personnel to do the hardfacing, do one a day until you know where you are at. One big factor in a hardfacing program is that, if possible, it should be done at a time when the weather is inclement or the rig is down for some reason, etc. If it can be done under those conditions, it is money in the bank.

After one year, you will have at least a dozen augers hardfaced and by then spending a couple of hours inspecting the augers and using your gauge(s), you easily will be able to figure if you should do one auger a month or one a year in the future. Depending on how often, and in what formations the augers are used, after you have all the augers hardfaced, you may find out that checking and maintaining the cutterhead once a year and hardfacing the lead auger may be enough.

Hardern-Helle CRC2 Open Arc Wire



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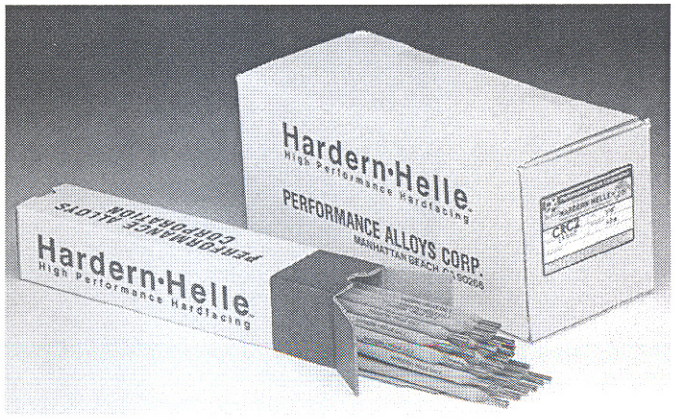
Hardern-Helle CRC2 Electrode



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