2009 DIXON SAFETY SURVEY

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Date:	January 19, 2009
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Randy Riatt, Walt Pendzinski and I were invited into the Nevr-Dri plant for the purpose of a safety survey involving hose couplings used at this facility. We were guided around the plant by Tony Petrasavich. This report contains my observations and recommendations on hose coupling practices, and the observations and recommendations of Randy Riatt as to the hose applications and use. Except where specifically noted, we did not attempt during our inspection to analyze the compatibility of various fluids, materials, hoses, and couplings.

During our introduction a few of the media variables were discussed. The following is a summary of those variables.

Air: 90 PSI	**Zylene: 60 PSI**
Water: 65 PSI	**Acetone: 60 PSI**
Steam: 115 PSI	**Naptha: 60 PSI**

OBSERVATION #1:

In at least six areas of the plant, we noticed air and water hose assemblies somewhat strewn about the walkway and lift truck drive aisles. Two specific areas you may wish to look at would be the air hose assemblies behind the #6 Roll Mill and the Crandall Filler.

The use of HOSE RACKS, or SPRING RETRACTABLE HOSE REELS is recommended in areas where hose is used over a wide area that involves high foot or vehicle traffic. These products keep the hose assembly safely and neatly off the floor when not in use. RACKS and REELS aid in the elimination of safety hazards, improve work area environment, increase the life of the hose assembly, and reduce hose handling labor. Information on these items can be found in the enclosed *DPL109* on pages 137 and 138, 422 through 424.

COILED SELF STORING AIR HOSE is recommended in areas where the movement of the assembly is primarily "up and down", with limited end pull. This type of assembly is intended for pneumatic (air) service only. For more information on this item, please see page 133 of the *Dixon DPL109*.

Action Taken:

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Date: _____

OBSERVATION #2:

At the Drum Wash Station, the #1 Pebble Mill, the #4 Pebble Mill, and a few other places on the tour, we noted common pipe nipples being used as hose fittings.

The use of COMMON PIPE NIPPLES as hose inserts should be discontinued. Industrial hose should be coupled with properly “barbed” or properly “serrated" hose stems.

There are two major problems with using COMMON PIPE NIPPLES in lieu of the proper hose fitting:

1) Pipe nipples have no barbs, or serrations on the body of the shank to safely secure them within the tube of the hose. They are either smooth or have sharp threads cut into them. If they are of the smooth design, there is nothing but friction holding them within the hose.

2) If they are of a threaded variety of pipe nipples, as the clamp is tightened down, the sharp threads will cut into the tube stock of the hose, causing a premature failure of the assembly.

A proper hose stem has barbs, or serrations designed to hold the fitting in the hose without causing any tube damage.

Barbed, or serrated hose fittings can be found throughout the enclosed *Dixon DPL109* catalog. An offering of “hose menders” can be found on page 252 and 253 of the same publication.

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Date: _____

OBSERVATION #3:

Cam arms were found to be missing from a number of couplers in your facility. Among these areas were the #3 Stone Mill and the #4 Stone Mill.

Some cam and groove couplers incorporate the use of a solid pin to hold the arms of the coupling in place. These tapered pins are placed in the holes of the casting by a press fit process. When systems encounter "spike" pressures, caused by short, high pressure surges in a line, the pin transfers the force to the coupling body. In time, this transfer of force weakens the press fit to the point of the pin dropping out of the coupling body. When this happens the cam arm falls off and is not available to lock the adapter in place. Other couplings incorporate the use of a roll pin which locks in place on both sides of the coupling body. This spring steel pin absorbs the forces caused by "spike" conditions and recoils back to the proper shape without transferring the shock load to the coupling body. With this type of pin system, the cam arms stays in place. The spring steel roll pin is standard on all Dixon "Boss-Lock" couplers.

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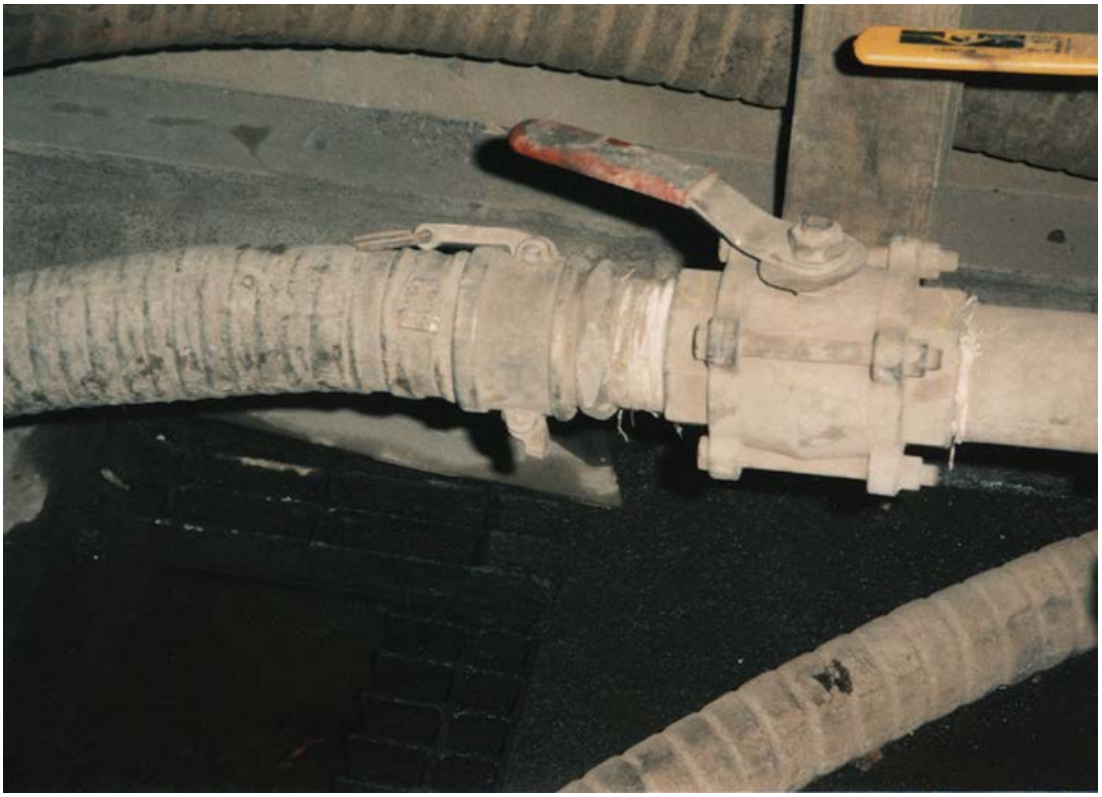
Date: _____

OBSERVATION #4:



In addition to the above mentioned missing cam arms, we also saw quite a few stainless steel and aluminum couplers that had broken cam arms. Two of these areas were the #1 Pebble Mill and the #431-1 Mixing area.

Commonly found on Stainless Steel Cam and Groove Couplers are two (2) types of handles or arms. They are Sintered Stainless Steel, and Investment Cast Stainless Steel. It is not uncommon to find these types of handles on Cam and Groove Couplers made of other materials (i.e.; Aluminum, Brass, Malleable Iron, etc.) as well. The sintered metal handles are the most common and are designed to withstand the abrasion caused by coupling and uncoupling the cam and groove parts. The stainless steel powder is pressed into the shape of the arm, and under pressure achieves the final, precise form of the finished cam arm. These sintered arms are subject to breakage when used in areas where the coupling will receive shock from dropping the hose assembly, or from dragging the coupling about in a rough fashion. If the arms are breaking, then investment cam arms should be used. These investment cast arms are designed to withstand almost any shock load put on them from the standpoint of normal coupling abuse.
Should you be encountering cam arms breaking on aluminum, brass or malleable cam and groove couplers, bear in mind that the investment cast handles will serve well as replacement parts. You will want to be sure there is no product incompatibility prior to switching these handles.

Another precaution to be aware of prior to changing parts is OEM related. The various manufacturers of cam and groove style couplings do not necessarily have compatible, or what would be termed "interchangeable" parts. It is recommended that you secure your replacement parts from the manufacturer of the coupling.

The Dixon "Boss-Lock" stainless steel couplers come with the investment cast arms as a standard feature. These items can be found on pages 20, 21, and 24 of the enclosed *Dixon DPL109*. The Dixon "Boss-Lock" investment cast stainless steel cam arms have an unlimited lifetime guarantee against breakage.
Replacement investment cast arms for the Dixon and Andrews couplers can be found on page 57 and 58 of the same publication.

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Date: _____

OBSERVATION #5:

In a number of areas of your facility, the #2 Stone Mill area and the #4 Ball Mill areas among them, we noticed that the arms of the cam and groove couplings were tied down.

Securing cam arms on couplers in the "down" or "closed" position by means of tape, wire, string, etc. is a step in the right direction.
Lockable cam arms, which are specifically designed, engineered and manufactured for this purpose are available. Please see "Boss-Lock" on page 20 through 27, 34 through 35, and 38 of the enclosed *Dixon DPL109*

Partially open, or fully open cam arms on hose assemblies are dangerous. This condition can be caused by a number of different reasons. Three of the most common are:

1) The operator fails to insure that the cam arms are fully closed upon "hooking-up" the assembly.
2) High vibration within the pumping system, combined with worn or missing gaskets.
3) High "impulse shock" within the pumping system causing severe wear on various parts of the coupler.

Whatever the cause, this unsafe condition must be corrected.
Education of the operator is essential. Periodic inspection of the condition of the coupling parts is also a safety requirement.

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Date: _____

OBSERVATION #6:

At the #2 Filler Line, the Walter's Filter area, as well as a few other places on the tour, we observed couplings that had either never been completely inserted into the hose or were being slowly forced out due to loose clamping or excessive pressure/vibration.

A hose assembly, to be completely safe and functional, must have the shank of the coupling fully inserted into the "square cut" end of the hose.

Action Taken:

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Date: _____

OBSERVATION #7:

Also at the Walter's Filter area, as well as a dozen or more other areas of the plant, we noted the pressurized hard piping was horizontal to the floor at the point of the hose connection. As a mater of fact, at the Drum Wash Station the air hose was beginning to develop a kink at the fitting as a direct result of this practice.

When a worn or weak spot is observed on a hose, the assembly should be removed from service to determine if a repair can be safely effected. If it is ascertained that the assembly is repairable, then the hose should be SQUARELY CUT 6 to 10 inches behind the questionable area. Once this bad section of hose is removed, the good section can then be recoupled, readying it for continuing service. The recommended repaired assembly should be pressure rated to 1-1/2 times the rated working pressure.

Wall and column outlets conveying pressurized media (i.e. steam, air, water, nitrogen, etc.), hard piped in a position horizontal to the floor can be both dangerous, and cost inefficient. If a hose should come off the end of a pipe, or a coupling be accidentally disconnected, the horizontal outlet would direct the flow of pressurized media towards the operator. Normally these outlets are positioned between knee and shoulder height on an average size person. The result would be disastrous.

The horizontal outlet also causes undue stress on the hose since the natural tendency of the hose is to "drape" downward, or vertical. Kinks rapidly become evident immediately behind the fittings, to the point of permanently damaging the hose.

By inserting a pipe elbow at the standpipe the flow of an accidental disconnect is directed away from the operator, towards the floor. The elbow also permits the hose to hang downward, in a natural state, thus extending the life of the hose.

At no time shall compressed air be directed toward a person. When compressed air is used, all necessary precautions shall be taken to protect persons from injury. (excerpted from Federal and Nonmetallic Mine Safety and Health Regulations [30CFR 56 and 57] Subpart "L" compressed Air and Boilers .13020)

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Date: _____

OBSERVATION #8:

The sharp tangs of worm gear clamps extended towards the hands of the operator were seen on the 1-1/2" water hose in the Drum Wash Station area, the 2" solvent hose in the same area, and on the 3/4" air hose assembly near the spare oxygen tanks in the Maintenance Shop. We also noted this same occurrence in a few other plant areas.

When properly used, in primarily low pressure air-water service, worm gear clamps provide an excellent means of holding fittings in hose.

They can however, prove hazardous in situations in which the sharp, excess, extended tang material protrudes from the clamp housing, and is in close proximity to the operator of the equipment. A prime example would be at the tool, or nozzle end of the hose which the operator handles on a regular basis.

Brass ferrules are an excellent, economical alternative to worm gear clamps. When properly installed, they offer excellent holding power with no sharp edges to adversely affect the operator.

Another logical alternative to be considered would be band style clamps. Upon installation of band clamps, be sure to offset the band buckles around the hose to eliminate the possibility of a STRAIGHT LINE LEAK.

Information on these alternative methods can be found on pages 311 through 315 of the enclosed *Dixon DPL109*.

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Date: _____

OBSERVATION #9:

We would strongly urge you to use two band clamps rather than a single band clamp on all pressurized hoses where banding is an accepted practice. A good example of a hose that is currently single banded would be the 3" I.D. paint product hose assembly in the Bulk Fill area. Incidentally, this same hose assembly is under quite a bit of vibration from the pump and one of the cam arms had opened. We closed it prior to leaving the area.

The use of the Dixon "Boss-Lock" coupling is recommended in areas of high vibration , or dangerous media where a cam and groove coupling is proper. The arms can be locked down by means of a safety pin. When the pins are in place, the arms cannot open accidentally. Please see page 14 of the enclosed *Dixon DPL109*.

Action Taken:

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Date: _____

OBSERVATION #10:

The alignment of band clamp buckles was a commonly noted occurrence throughout the facility. Examples can be seen on the 2" I.D. paint product hose in the Bulk Fill area and the 3" I.D. combined solvents hose at the Outdoor Tank Farm area.

Prior to a fitting being inserted into the hose, it should be placed along side the hose to its intended depth. A mark should be made on the outside diameter of the hose to indicate where the bottom of the shank will be after it is inserted.

The clamps should be applied in the area between the mark and the squarely cut end of the hose. The clamps should *never* be applied below the mark.
If the shank of the fitting should have defined areas that are higher than the regular serrations, or barbs, this area should also be marked on the outside diameter of the hose and no clamping devices should be placed on these high areas.

Clamps placed below the mark can actually lead to the forcing of the fitting out of the hose over a period of time. Clamps placed on the high shank areas can lead to leaks.

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Date: _____

NOTE:

We discussed with our tour guide Mr. Tony Petrasavich, your current method of "hard piping" between elements of your Filter, Regulator, Lubricator air prep units. He said that a normal time for a change-out of a unit is about 45 to 60 minutes. We showed Tony a sample of the new, modular Wilkerson units (pages 114-124 of the enclosed Dixon DPL593) and he felt we should definitely mention them to you in this report. Tony was able to change a unit out in under 2 minutes.

For your convenience and consideration we are including the following General Hose Coupling Recommendations with the hopes that they further your Safety Program.

GENERAL HOSE COUPLING RECOMMENDATIONS

A. Dixon does not recommend the altering of any of our clamps, fittings, or other products by anyone in the field. The Dixon product line is engineered to precise tolerances, intended for specific services. The altering of a finished product can cause changes in the metal, or other properties of the product resulting in safety concerns for the user. If you have a special application, not covered by our standard product line, please contact Dixon or your Dixon Distributor for advice.

B. When a worn or weak spot is observed on a hose, the assembly should be removed from service to determine if a repair can be safely effected. If it is ascertained that the assembly is repairable, then the hose should be SQUARELY CUT 6 to 10 inches behind the questionable area. Once this bad section of hose is removed, the good section can then be recoupled, readying it for continuing service. The recommended repaired assembly should be pressure rated to 1-1/2 times the rated working pressure.

C. Once it is determined that a hose, fitting, or clamp is beyond service, it should be removed from the area and properly discarded. Too many times these old, worn hoses and fittings are allowed to remain on the plant premises, creating a hazard and increasing the possibility that the item(s) could be placed back into service by an inexperienced person. The only way to insure that this cannot happen, is to completely remove the damaged parts from the plant, immediately upon deciding through test or inspection that they are no longer safely serviceable.

D. The use of COMMON PIPE NIPPLES as hose inserts should be discontinued. Industrial hose should be coupled with a "properly barbed, or serrated" hose stem.

There are two major problems with using COMMON PIPE NIPPLES in lieu of the proper hose fitting:

1) Pipe nipples have no barbs, or serrations on the body of the shank to safely secure them within the tube of the hose. They are either smooth or have sharp threads cut into them. If they are of the smooth design, there is nothing but friction holding them within the hose.

2) If they are of a threaded variety of pipe nipples, as the clamp is tightened down, the sharp threads will cut into the tube stock of the hose, causing a premature failure of the assembly.

A proper hose stem has barbs, or serrations designed to hold the fitting in the hose without causing any tube damage.

E. The CORROSION RESISTANCE GUIDE on pages 218-223 through 145 of the enclosed Dixon DPL197 serves to assist you in selecting the proper material for the coupling body and for the gasket. Use this chart whenever there is a question regarding chemical compatibility.

F. In order to achieve the longest possible life out of a hose, the assembly must be compatible with the media that is going through it. It is important to maintain a color code or tagging system to keep the hose assembly isolated to the service that it is intended to be used for. This reduces the opportunity for operator error and enhances safety.

G. A safety problem exists when hoses used in different services have the same coupling system. For example, if a steam hose and a water hose have the same coupling system, an inexperienced operator could quite easily connect the lesser rated water hose to the more critical steam application, and disaster would be imminent. We recommend the use of completely dissimilar hose fittings for services such as steam, air, nitrogen and water. For example: Steam Hose - "Boss" Fittings and Clamps . . . Air Hose - "Air King" Fittings with the appropriate clamp . . . Nitrogen Hose - "Dual Lock" Fittings and clamps . . . Water Hose - Brass Long Shank threaded GHT and clamps. This is only an example, and a number of different fitting combinations are possible.

H. Double Spuds are used to connect two lengths of hose that are coupled with female Boss style fittings on at least one end. The thread on the wing nut and double spud is NPSM. The double spud also has a hex to assist in tightening. Double Spuds are recommended over other types of connections such as close nipples, which are threaded NPT, or other pipe products which have a hex. These parts can be found on pages 25 and 26 of the enclosed Dixon DPL197.

I. An on-going program of inspection of fittings, clamps, and/or ferrules must be instituted to maintain safe and operable assemblies. The inspection should include the body, all threads, seals and clamps (ferrules). If gaskets are damaged or missing, they must be replaced immediately. Fittings, clamps, or ferrules damaged beyond repair must be removed and replaced immediately.

J. Static electric grounding is important on a steam hose. Where static electric grounding is required, a test shall be conducted after completion of pressure testing of the assembly. The hose shall be tested on a non-conductive surface using an OHM meter to measure the electrical resistance of the hose between the couplings. The maximum allowable resistance shall be 20,000 ohms per foot of hose. A check with an OHM meter is the only way to be sure of continuity.

K. An exposed helix wire at the coupled end of the hose poses a real safety threat to the operator, as well as the equipment. When these sharp extensions are discovered, wire cutters should be used to trim them back to approximately 1/8 inch into the carcass of the hose. The ideal time to do this would be prior to the hose being coupled.

L. A system of inspection of hose and hose fittings should include a marking system to identify when the assembly was last inspected. An easy way of accomplishing this identification is to use color tape signifying the year when an assembly was last inspected. For instance, in the first year of the plan, a red tape is used at each end of a newly installed or tested hose assembly. At the end of the calendar year, blue tape would be used, and all hoses "red taped" would have to be re-inspected, and when approved, would have the blue tape placed over the red tape. Each year a new color of tape would be used. Company policy would have to be instituted to insure that no hose would be used unless it carried the current year's identifying color tape.

M. "Boss" Male Spuds are used to connect the wing nut of a "Boss" coupler to a female NPT outlet. This male spud eliminates the use of a common pipe nipple (threaded both ends) being used between a female "Boss" spud and the female NPT outlet. The "Boss" spuds are of a much heavier construction than common pipe nipples, and are an essential component in the safe operation of the overall system. Should it be deemed necessary to use common pipe nipples, nothing less than seamless schedule 80 should be considered due to the 10 to 1 safety factors demanded by steam.

N. As we had advised at the time of the Safety Survey tour, this assembly should be removed from service, and properly discarded. Continued use of this assembly may prove to be hazardous.

O. Some hose assemblies, due to the layout of the piping system, have great stress put on the assembly just behind the end of the coupling stem. This area of high stress causes a premature hose failure, and poses a safety threat to the operator. Consideration might be given to using an "EXTERNAL SPIRAL SPRING."

The "Spring Guard" is a spiral shaped coil that goes around the O.D. of the assembly at the end of the hose. It serves to give stress relief behind the fittings, thus increasing the life of the hose.

P. The effects of weather and ozone can take an extreme toll on hose assemblies both outside and inside a plant. Care should be taken to check these assemblies, on a frequent basis, for cover damage to hose and corrosion of fittings and clamps.

Q. Improperly applied ferrules or clamps can sometimes be the cause of hose damage in the area of the fittings. This damaged hose can result in a real safety threat when conveying flammable, or flame supporting gasses in the area of open flame. Care should be taken to inspect these hose assemblies on a frequent basis, and to repair or replace them as needed.

R. In order to relieve a hose assembly from being over torqued it is often wise to install a female union fitting at either the valve, or the process vessel. Such a union adapter is offered in the "Boss" configuration. The GMAS series on page 31 of the enclosed Dixon DPL197 is threaded male NPT at one end to thread into a female thread at the vessel. By adding the proper wing nut to the opposite end of the GMAS a Ground Joint union is now available for connection to the hose.

CONCLUSION

After reading the above information you have probably realized that most of the observations and their subsequent recommendations are primarily of a "preventative maintenance" nature and would be quite cost efficient to put into effect.

Your concern for safety within the plant is very obvious and we wish to thank you for allowing us to participate in your on-going safety program by means of this hose and coupling safety survey.

Thank you for the opportunity to visit your plant. We hope the recommendations given here today will help make a safer environment for your people. Naturally, it would have been impossible to view every hose coupling in your facility. Our goal was to help point out areas of concern and to draw attention to practices where improvements in hose coupling safety could be made. Specific information concerning hydrostatic testing and inspection can be found on pages 13-15 in Chapter 6 of the enclosed RMA Excerpts. More detailed information on specific hose styles can also be found in the RMA Bulletins following page 15. Our inspection was limited to only a visual examination. Internal problems or defects with hose fittings not subject to visual inspection can only be determined through a complete hydrostatic test procedure. Our inspection of hose couplings is not a guarantee of performance of the hose, couplings or any part of the inspected assembly.

By conducting hose coupling inspections and issuing recommendations or reports, Dixon is not assuming any responsibility or duty to you or any duty you owe to others. Our coupling inspection was not intended to detect or point out all hazardous conditions but rather to draw attention to some areas of concern and those practices where improvement in hose coupling safety could be made. This coupling inspection is not a substitute for your sole responsibility to make inspections, take whatever action may be necessary to prevent losses, to enforce safety procedures, to detect and eliminate hazardous conditions, and to comply with all federal, state, and local laws, rules and regulations governing safety and health.

Dixon offers the services of our Engineering department to aid customers with special and unusual connecting or installation requirements. If you would like more information on this service please contact Randy Riatt at (313) 555-0001.

If you have any questions about the findings in this report please don't hesitate to call us. We would like to offer our service of conducting a short seminar for your shop personnel to instruct them in the proper selection and installation of clamps and couplings. If you would like to take advantage of this free service please contact Randy Riatt, from Rubber Connection Supply, at (313) 555-0001 to set up a meeting.

Dixon strongly recommends continuing the inspection process of hose and couplings only begun with this Hose Coupling Safety Survey. It was a pleasure working with you on this project.

Sincerely,

George Shea
Dixon Valve & Coupling