

# MDG41, CONVERTING THE GUIDE LINES TO PRACTICAL SOLUTIONS

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We hear MGD41 (Mechanical Design Guideline #41 for fluid power safety at mines) referred to at every safety meeting and conference in Australia today. However, properly understanding the guidelines has been one of the greatest obstacles to effectively implementing them. We need to remember that the guidelines were prepared in cooperation with New South Wales Department of Primary Industries (Mine Safety) safety and a number of Manufacturing Hose and Fittings companies. While these companies support mining industry, they are not integrated or fully aligned with Mining Business Systems. This becomes apparent when you try and implement the guidelines.

This paper will look past trying to solve this issue with a complete system you can buy. It will show how a mine can take control and implement simple practices and processes to move closer to meeting MDG41. It will also show simple products that can be purchased to assist with this. In doing so, management of safety returns to the mine where it belongs.

Let's be honest, companies offering assistance to meet the MDG41 re doing so because they believe there is profit in it for them. Furthermore, as the customer, we are often confused by a document that was not written in our language open in many cases to often conflicting individual interpretation.

At Century I created an MDG41 manual and associated work instructions manual. They were written to meet our International Organisation for Standardisation (ISO) systems. I designed our manual to be integrated into Work Management Systems with SAP, tying individual hoses to specific work orders. This allowed for on-site manufacture and testing as well provision through OEM (Original Equipment Manufacturer) and aftermarket supplied hoses. I also developed a tracking system that tags a hose and manually or electronically allows tracking as it is issued. This system has the ability to reverse engineer at replacement time and update future hose replacement.

Today I will share is some key parts these documents – things that can be easily put in place to immediately improve safety. I will also list the vendors we purchase these from as a starting point for those interested is using these ideas to improve your own safety in this area.

## **Training**

Training your fitters in MDG41 is one of the best ways to improve in this area. While anyone can see broken wires sticking out of a hose or a leak at the end of a fitting, most fitters are never shown how to identify hose age by checking for ozone attack to the cover or loss of elasticity. Many fitters haven't been trained to fully understand the dangers hydraulic hoses possess and that we

should not think it is only a minor leak or a bit of cover missing. At Century we worked with Tropical North Queensland Institute of TAFE to develop an accredited MDG41 training course. 80 of our fitters have now completed this training. This is a good first start... The course is comprehensive, broken theory and practical requirements.

Contact: Rod Groch at North Queensland Institute of TAFE, email: [rod.groch@deta.qld.gov.au](mailto:rod.groch@deta.qld.gov.au)

### **Burst protection sleeve**

Since MDG41 was developed many advances have been made to better prevent of fluid injection. There is a product manufactured by Mazzer in Italy that; in most situations, and if used correctly, can prevent fluid injection injuries occurring as a result of hoses and tubes to 12,000psi. The product, "Texsleeve™", comes in fully formed tubes or in a wraparound form. There are other products in the market place that look similar to Texsleeve but are not.

Ask for empirical evidence, say to the seller, "please give me copies of the test data that proves your sleeve will stop oil streams to the pressure you require". Be persistent - if you have nothing after 10 days it is probably because it does not exist. Other than through Mazzer, I have been unable to find any empirical evidence to support claims by others that their sleeve prevents fluid injection injuries. Some products will provide wear protection and perhaps some fluid injection protection to lower pressures, but I have found no empirical evidence they will be effective to 12,000psi as is Texsleeve. Remember I said the guideline is open to interpretation. MDG41 talks about the need to provide wear resistance, so if I have a product that has wear resistance, I can say my sleeve meets the guidelines for MDG41. In fact it may only meet one part of the guidelines - and not the most important part, that being to stop fluid injection injuries.

So when they look all the same, how do you tell you have the genuine Texsleeve, It is very simple.

All Mazzer Texsleeve, regardless of branding must carry the Mine Safety and Health MSHA approval number of IC-207/1 (Refer below extract of letter to Mazzer from MSHA)

In Reply Refer To:  
MSHA:A&CC:PAR 86026  
Acceptance Record File  
No. IC-207/1

August 31, 2000

Mr. Ernesto Meli  
Mazzer Industries, Inc.  
700 Mile Crossing Blvd.  
Rochester, New York 14624

Dear Mr. Meli:

Your application dated June 29, 2000, requesting acceptance of "TEXSLEEVE" abrasion sleeve for use in underground mines was evaluated by the Materials and Explosion Testing Branch, Engineering and Testing Division, Approval and Certification Center.

This product and the information provided meet the requirements of the Interim Fire Criteria for acceptance of products taken into underground mines. This product is assigned Mine Safety and Health Administration (MSHA) No. IC-207/01 and may be referred to as "accepted for underground mines when used in accordance with the manufacturer's health and safety instructions and recommendations."

Now if the product does not have the MSHA number IC-207/01 on it, but an alternative approvals number it not Texsleeve. Here is an example of Texsleeve with different Branding but the same MSHA approval number.



I purchase Texsleeve from Ausdraulics Holding Pty Ltd in Townsville.  
PH: 07 4774 6355

You can buy Texsleeve product in Australia from a number of sources. The sleeve is good for individual hoses and tubes, while the Wrap version with Valcro is good for bundles of hoses like you find on drills.

### **Warning Tape**

Warning tape is another simple product that can be put on hoses to improve awareness of potential hazards. The tape is printed with a warning and can be fitted to any hose or tubing, helping keep in front of mind that fluid carrying tubes present serious safety risks. This is good to raise awareness on any hose you do not fit a cover to. It's just like packing tape but is yellow with Black writing.



This tape comes from Greenpac in Sydney.  
Contact Dominic - P 0425 810 410

### **Hose identification tags**

Identification tags are another simple way to manage your hoses. Now there are many different types of these: paper plastic, colour coded. Sometimes the information is hand written, others you need expensive machines to print them. MDG41 suggests you require lots of information to be stored on the tag that needs then to be fitted to a hose. However most of what you need is recorded already during manufacture and putting it in the tag is only duplication. Providing the makeup of hose assemblies is being recorded and you have a copy of this record, all you require is a single tag with a unique number that can be traced back to the records if needed. Most hoses will be changed out under planned conditions and require no further investigation. You can use RFID tags made especially for hoses that store a number unique anywhere in the world. They can be attached in a number of ways: one type uses a cable tie, another is FOB type, there is one with adhesive, and another that can be fitted under heat shrink. I have purchased and used the one below, which works very well. These chips are read using a hand held RFID reader.



These RFID hose tags come from InfoChip in Canada. You can contact them for Australian distributors at this email.

Chris Gelowitz  
President & CEO  
InfoChip Systems Inc.  
Ph: 780-361-1133  
Email: [chris.gelowitz@infochip.com](mailto:chris.gelowitz@infochip.com)

Using these RFID tags I have developed a process to allow for the RFID reader to record the chip number and upload into SAP against the Work order number.

If you wish to run a manual system this is also not difficult.

Simply create a manual test certificate sheet where you record the information you want to capture about the hose. Ensure you record the Work Order number as you will need it later. This manual record can be scanned into the Work Order and an Excel spreadsheet set up to record the hose number against the Work Order number.

You can then purchase two different plastic zip ties tags; one showing a unique hose number and the other a date.

I have built a table for the date tags for the next five years. Caterpillar™ put the life of a track machine at 15,000 hours for Century this represents approximately 2.5 years of operation. So if the OEM recommends replacement at the life of the machine, then 2.5 years is the maximum life for a Caterpillar™ hose in a continuous operation.

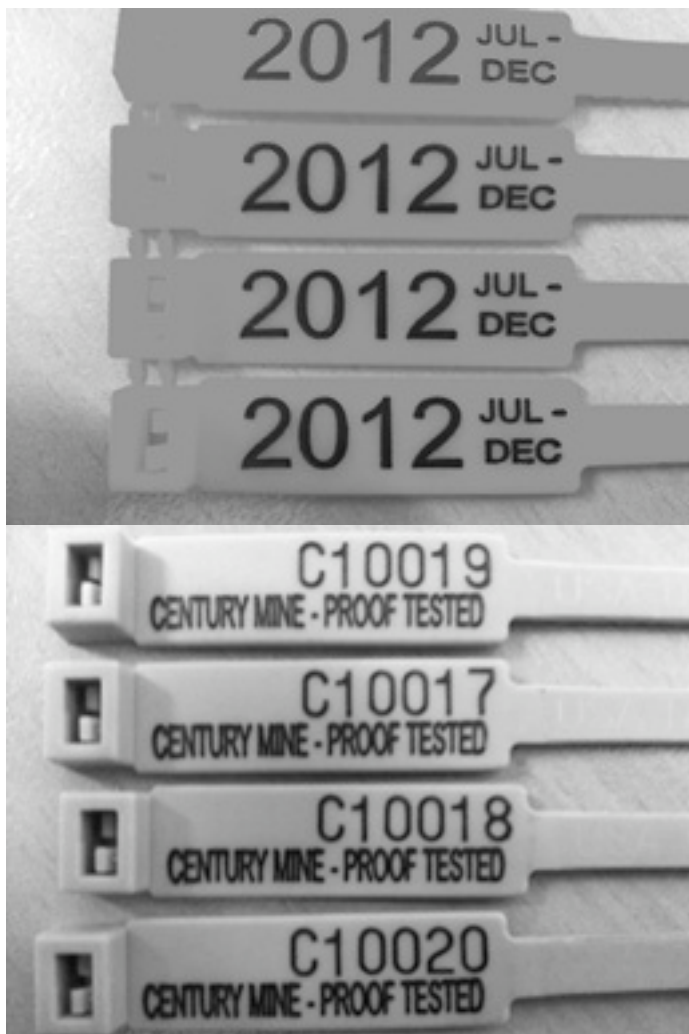
You can work with your OEM to establish a life line for each of your assets using hoses. Fixed plant is more difficult, the life of a hose stored in a climate controlled dust free environment is usually eight years, less than that is required for operational hoses. This is why I have five years of tags -more than this for a hose in service and you risk unscheduled downtime through hose failure. Most hoses on fixed plant are static applications and work less than those in impulse situation on mobile equipment.

I have created date tags that are different colours for each year, 2012 is yellow, 2013 is white, 2014 is red, 2015 is green and Blue for 2016. Each tag also shows either JAN-JUN or JUL-DEC to show what part of the year it was

fitted. It is important, these date tags be fitted when issuing the hoses to the Work Order. This is because some hoses in stores may sit there for over 12 months. At the end of each six month period unused tags should be quarantined. Keep these for five years as you might need some of them again. By controlling the distribution of t tags you can ensure date accuracy when fitting hoses. For this reason, control of this should be done by the issuing area.

Bulk hose has a shelf life of eight years from manufacture; this date is printed on the hose. What we want to know when we change a hose is when we fitted that hose. Now as you replace hoses you will soon be able to see what hoses have been changed and in what year. Any hose without a tag has not been done. So at Century, any hose that does not have a date tag after 2014 (2.5 years) has reached the end of its life. This will help find hoses that have not made it a scheduled change out or material Bom's.

The unique hose number is important for your reliability engineering team to improve utilisation in this area. Those wanting to investigate a specific hose can use the unique numbering tag and look it up in the register to find the Work Order number. Your engineering team can then make accurate replacement decisions based on what condition the hose is in and amend change out times and Bom's as needed.



These Tags come from JTAGS on the Sunshine Coast  
Email: info@jtagz.com or PH: 07 4930 2501

### **Flange Blanks**

Flange blanks. Now I admit, I missed this in the guidelines until one of our fitters raised it as a hazard after participating in the MDG41 training course (it works).

The guideline reads as follows:

“7.1.6 Pressure Intensification: Any component with the potential to intensify shall be supplied with plastic caps that will blow out in the event of the component being pressurised and the cap not removed.”

I looked at a few ways to address this and found Caterpillar make a range of fibre blanking gaskets for code 61 flanges and Caterpillar code 62 (XT5) flanges. They resist both water and oil. All you do is remove the hose or cylinder and using the existing clamps and bolts fit them under the clamps and tighten up. They are perfect for sending items off -site or during maintenance on-site to protect against contamination. I did some burst tests on-site and found they burst at 150psi. My only issue was using the Caterpillar code 62 flanges for general code 62 requirements as it only has a 2 bolt design to match the Caterpillar clamps. Because I only have Code 62 in 2 sizes I use a WAD punch and another gasket to make some gaskets with four holes.



These can be purchased from any Caterpillar distributor.

So now we have some components:

- Manual testing form that includes a location to record the Work Order number and hose tag number, hose specifications and so on;
- Dated hose tags;
- Hose tag with unique number; and
- Textsleeve

### **What do we do with them?**

There are three ways to get a hose assembly: you make it yourself, you buy it from the OEM, or you have it made by an aftermarket vendor.

During the warranty period you will probably need to buy from the OEM.

Outside this period you have more options. Some OEM's proof pressure test hoses as part of their assembly process. Ask them if they do and also for a copy of the test certificate or where to find the reference number on the hose. Often this number is stamped into the ferrule so if you have a problem you can then request a copy of the test certificate, if needed. You can then reference the OEM test number in the manual record in your system against the Work Order.

Almost all aftermarket suppliers will proof test a hose for a cost, check this cost against the OEM you might be surprised you can often get a proof tested hose for equal to the OEM. The third option is to make it yourself, but if you don't have a test rig you cannot fully meet this part of the guidelines. At Century we have a Maximator test rig purchased from Maximator in Brisbane.

This cost can be paid for if it stops just one hose end blowing off on a critical asset. Proof testing the hose is one of the major keys to assurance that a hose when fitted will last the distance provided the operating pressures or hose specifications are not exceeded.

Contact for Maximator:

Ph.: 61-7-3255 5583 Email: [sales@maximator.com.au](mailto:sales@maximator.com.au)

So armed with all this, what can be done to improve hose safety? If an OEM or aftermarket supplier sends you a hose either tested or not and if rated under 800psi you can fit both a date tag on each end and a single number tag in the centre. The date tag will only be required once the hose has been removed, or if you wish to change out a specific hose against a work order. Remember many hoses have identical OEM part numbers in multiply locations, the number tag can help ensure you change the correct hose. A date tag at each end of the hose helps with visual identification of the hose and the colour ties it to a specific year, a closer inspection shows if it was fitted in the first or second half of the year. A date tag on each end is important as many hoses are of a length you cannot see both ends at the same time. The same of course should be done for hoses you make onsite. Record all the hose information on the manual test sheet.

For hoses above 800psi this is where the Textsleeve comes in. At Century I developed an innovation last year to fit this sleeve to 10,000psi single and twin hoses for use on Hydraulic tools and rescue equipment. For general hoses the process to fit Textsleeve is very simple, especially for larger high pressure hoses.

Because Textsleeve is a sock it can be fitted onto most hoses after manufacture, so you can do this even for OEM supplied and aftermarket supplied hoses. You will need a good pair of sharp scissors, the Textsleeve, Heat gun, Pencil soldering iron, and date tags.

Cut the Textsleeve with scissors and use the heat gun to fuse the ends from fraying. 300 degrees should do this, and then about 5mm down from the cut ends use the soldering iron to melt 2 holes. These should be larger than the



neck of the fitting. If a bend fitting this is easy, if a straight coupling keep the width to the smaller size of the ferrule. Now use the date zip tag to go through the hoses and chock the sleeve. Remember Textsleeve is not being used to hold the fluid; it is being fitted to prevent a fluid injection injury. Remember to record all the details off the hose before you cover it.



This photo shows the back of the date tie on a bend and the straight is strangled against the edge of the ferrule preventing the Textsleeve from sliding down the hose.

Another benefit of the Textsleeve is that it is highly resistant to abrasion so will also protect the hose from rubbing. Some people might say “but I can’t see the hose type or pressure rating with the Textsleeve fitted; how is it possible to tell if it is damaged hose has the correct hose pressure”. This is easy to answer, because if you fitted the hose from new all details were recorded at that point, and if the hose has some sort of cover or mechanical damage this will also impact on the Textsleeve. If the Textsleeve is damaged the hose underneath it probably is to. If you want to check the condition of a specific hose you can cut off the date tag, slide down the Textsleeve and look. If it is OK, use one of same date tags from quarantine to secure it again, or replace the hose if needed.

This very simple site fix will remove almost most risk associated from fluid injection. If fitting the Textsleeve and the hose passes through retaining clamps you will need to change the clamp if necessary to allow for the sleeve.

Textsleeve burst suppression qualities also have the benefit of assisting to prevent misting of flammable fluids around heat sources that cause fires on mobile equipment. Remember, though, Textsleeve is only appropriate under 400 degree Celsius so using it next to Turbo will not work alone, I am doing some tests at present on fitting Firesleeve over the top of Textsleeve to see if I can keep the temperature under 400 C.

I hope you find these ideas of use in improving hose safety within your business. Should you require further information or would like to share your

own ideas with us; I would love to hear from you. I can be emailed at [david.leonard@mmg.com](mailto:david.leonard@mmg.com)