



TREFIMET
ENGINEERING IN THERMAL LANCES

**TREFIMET
THERMAL LANCES
USER MANUAL**



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RISKS AND CONSIDERATIONS

THE OPERATION OF THE EQUIPMENTS - THERMAL LANCE/OXYGEN HOSE AND OXYGEN SUPPLY MUST BE DONE BY AT LEAST TWO PERSONS: THE OPERATOR AND HIS ASSISTANT.

It is extremely important to prepare the equipments to be used before starting the operation. Be sure you have the proper oxygen supply and number of lances to be used; the work place must be clear and free of any combustible elements. During lancing operations, the assistant must be alert to the operator's instructions (mainly in the regulation of oxygen) and in case of emergency, to cut off the oxygen supply.

Both the operator and the assistant will be exposed to risks such as: thermal stress due to high temperatures exposure, splashing of particles and / or molten material and exposure to fugitive gases and fumes.

NEVER OPERATE A THERMAL LANCE WITHOUT PERSONAL PROTECTIVE EQUIPMENT.



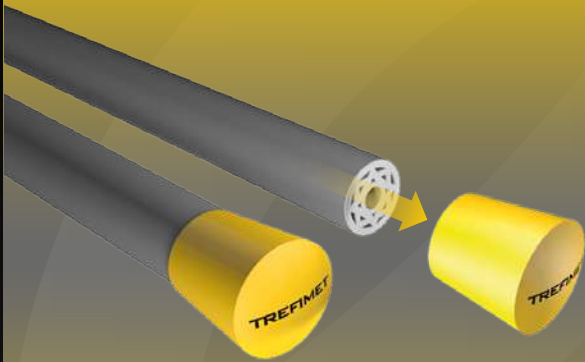
Trefimet's thermal lances are a exceptional engineering tool that requires technical procedures and the safety for the correct use thus avoid the risk of incidents, minor accidents, mayor accidents or even death risk.

PACKING, HANDLING AND STORAGE

Trefimet Thermal Lances are packaged in bundles of 50, 100, 150 and 200 units, depending on the type and weight. The packaging consists of a plastic burlap sack at each end of the bundle, which is then wrapped in stretch film of different colors, depending on the length of the lance.

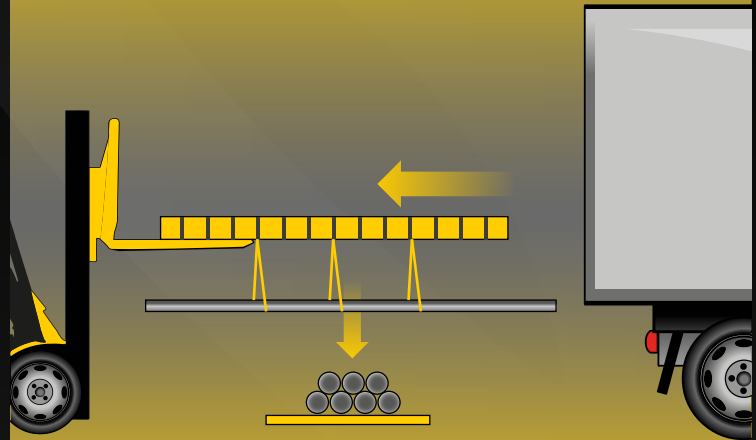
A FORK LIFT EXTENSIONER IS REQUIRED TO MOVE THE BUNDLES.

STOPPER



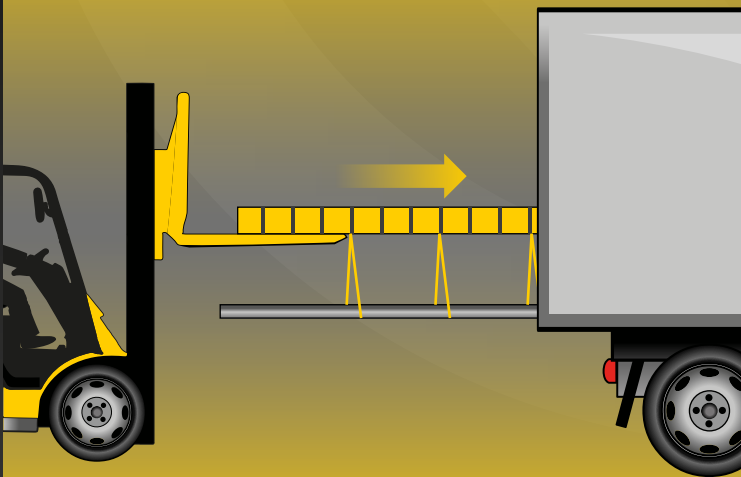
Each lance end is protected with a plastic stopper that covers and protects the bevel and the connector of hits, rust and contamination. These stoppers have different colors, depending on the type of lance or its diameter.

UNLOADING PACKAGES FROM THE CONTAINER



After unpacking the packages from the container, unload one by one by placing 2 or 3 slings, verifying that they are balanced when being lifted.

LOADING A CONTAINER



To load the bundles into the container, place 2 or 3 slings (depending on the length of the bundle), and adjust them in order to balance it when being lifted. Bundles are placed one by one inside the container and, once the stuffing is finished, the full load must be secured with 3 slings to the container itself.

STORAGE



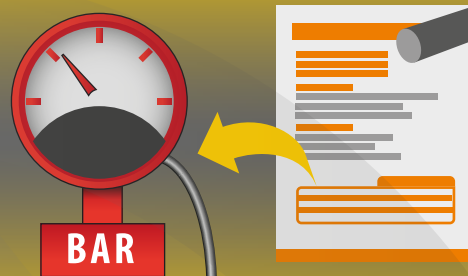
Bundles must be stored indoors and in locations that protects them from manipulation, away from direct sun, moving machinery or other potential damage like excessive humidity.

RECOMMENDATIONS AND REQUIREMENTS

Each arrangement of thermal lance must consist of a shielded highpressure wear-resistant hose, an oxygen cut-off valve - or a two-in-one lance holder (with safety valve) connected to an oxygen supply system. Oxygen lines deteriorate due to friction and oxidation, generating internal waste that is dragged by the oxygen flow causing internal friction and bumps in the elbows and curves of the hose, which increase the temperature to a level that can generate ignition in the hose. Comply with the maintenance schedule of the oxygen lines and change them after the end of their useful cycle.

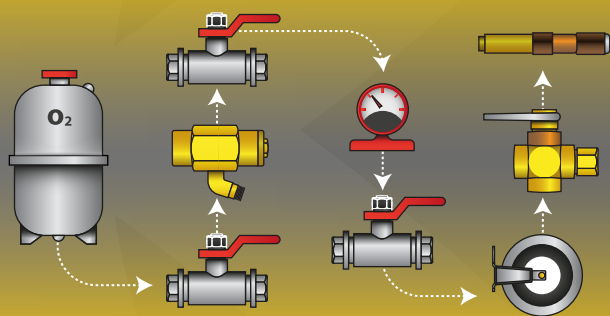
FAILURE TO COMPLY WITH THESE RECOMMENDATIONS COULD CAUSE AN ACCIDENT

OXYGEN PRESSURE AND FLOW



For efficient use of the lance, it is key to regulate the specific oxygen flow for each type (according to the technical sheet). We recommend having a pressure gauge in the socket for the lance. If connected to an oxygen tank, use a high flow regulator.

OXYGEN LINE



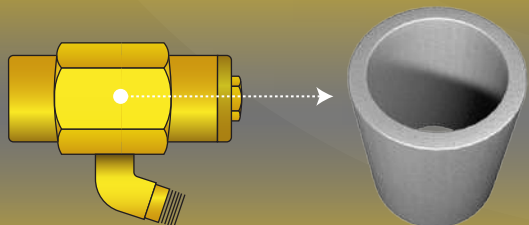
For the operation of thermal lances we recommend to have a standard oxygen line, (with seals, shut off and regulating valves and filters) that supply oxygen with not contaminants.

PERSONAL PROTECTION EQUIPMENT



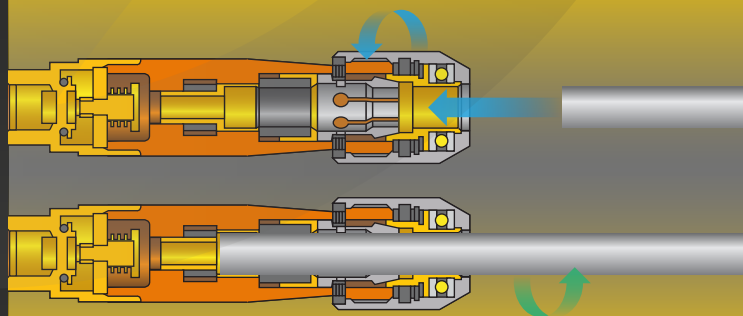
Operators must have complete personal protection equipment suitable for handling Trefimet thermal lances. (Hood, leggings, pants, vest, etc.).

OXYGEN FILTER



A filter of at least 40 μm (microns) must be provided at each oxygen connection point to avoid the arrival of particles that can generate temperatures in the hose with risk of ignition.

CONNECTION TO THE LANCE HOLDER

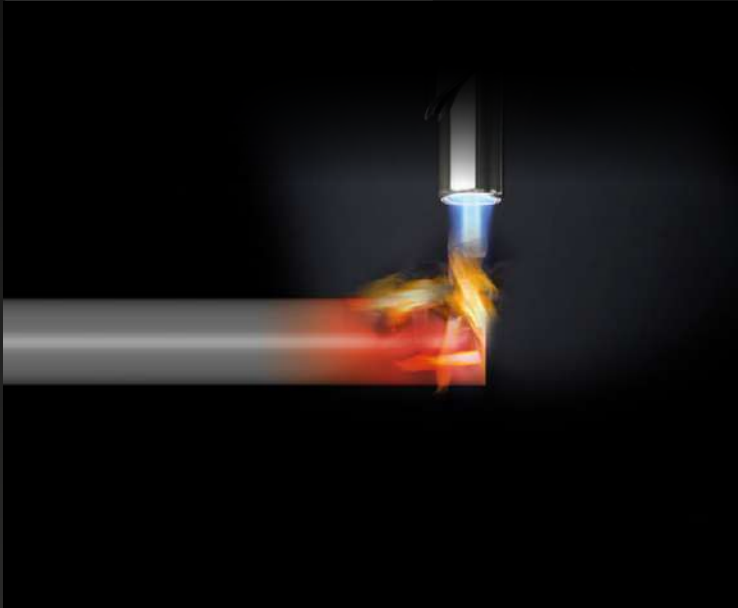
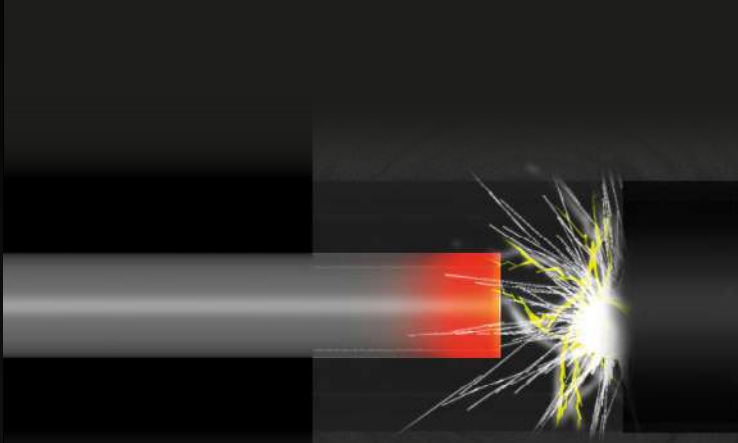


After checking that everything - oxygen network, personal protection equipment and work area - is in perfect condition, insert the lance fully into the the lance holder, tighten thoroughly with the locking nut and check that there are no leaks.

THERMAL LANCE IGNITION

With the lance connected and the SAFETY requirements fulfilled, the lance can be ignited. There are different ways to get the tip of the lance to its ignition point (870 ° C) to ignite: with electric arc, with oxyfuel equipment and coke carbon, among others. They can be classified into 2 types of ignition:

A) LANCE TIP HEATING WITHOUT OXYGEN



This type of ignition is performed using external heat sources for heating the tip of the lance, such as: torches, oxyfuel, electric arc, hot materials, etc.

IT IS RECOMMENDED TO USE HEAT SOURCES THAT GENERATE MORE THAN 1,300 °C

IN COPPER SMELTERS, NEVER IGNITE A THERMAL LANCE INSIDE THE TAPHOLE.

B) LANCE TIP HEATING WITH OXYGEN



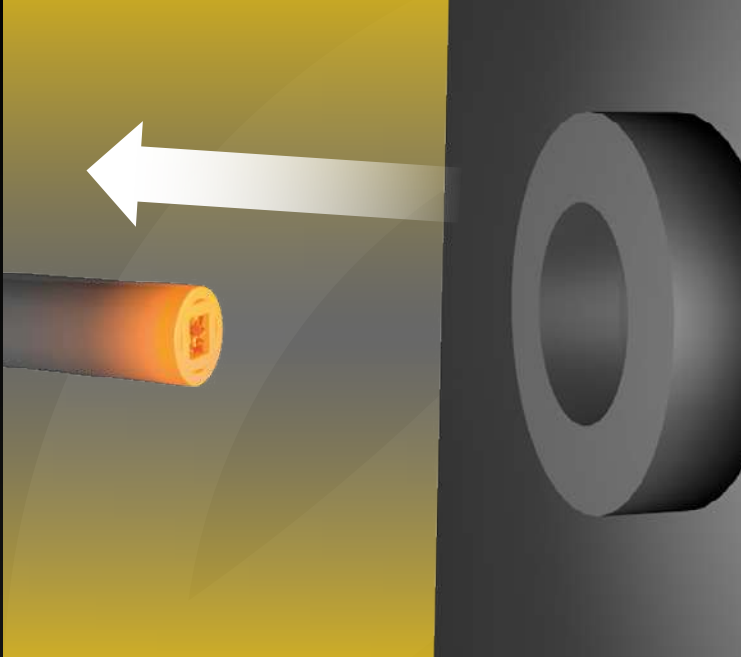
This type of ignition is made with combustible materials such as coke carbon, wood, cardboard, etc., taking advantage of oxygen to accelerate combustion. To ignite the lance with this system, the tip of the lance should touch the combustible material and allow a low amount of oxygen to pass.

Oxygen increases combustion by heating the tip of the lance until it begins to generate glowing material (large sparks). At that time the oxygen flow has to be increased progressively until it is turned on.

LANCE CUT OFF

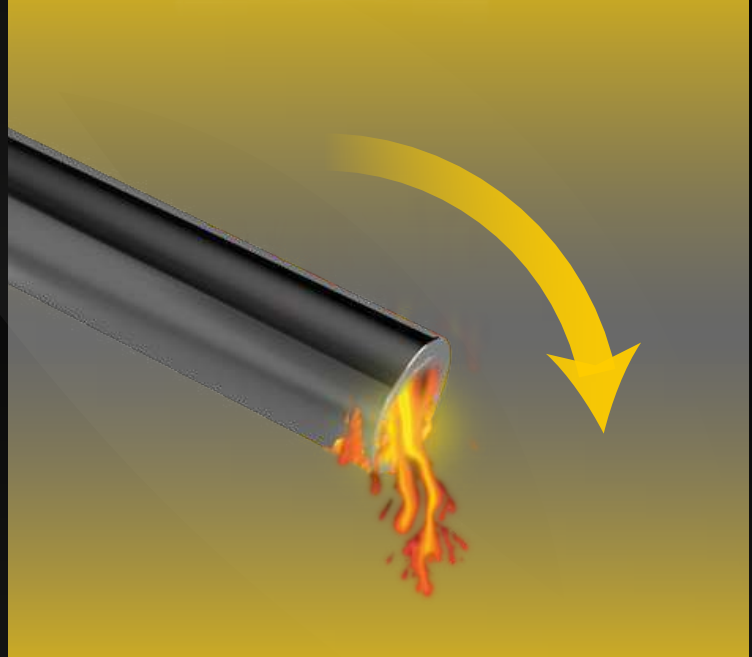
Once the operation is completed, it is important to follow the following steps to turn the thermal lance off quickly and safely:

REMOVE THE THERMAL LANCE



Remove the thermal lance from the object. NEVER CUT THE OXYGEN FLOW WHILE THE LANCE IS STILL IN CONTACT WITH THE MELTED MATERIAL.

INCLINE THE THERMAL LANCE



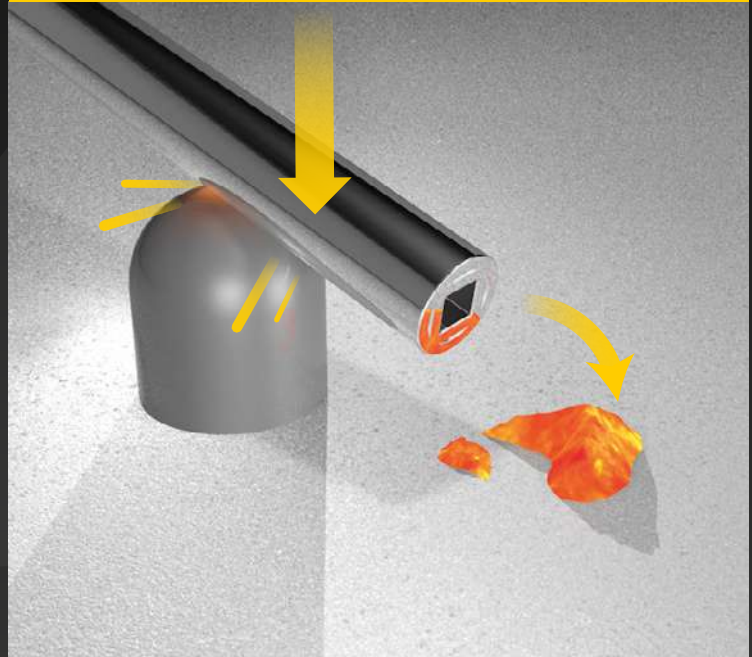
Incline the lance with the tip down to make it easier for the melted material to come off the thermal lance.

OXYGEN FLOW CUT



The assistant must shut off completely the Oxygen flow from the valve.

CLEAN THE TOP OF THE THERMAL LANCE



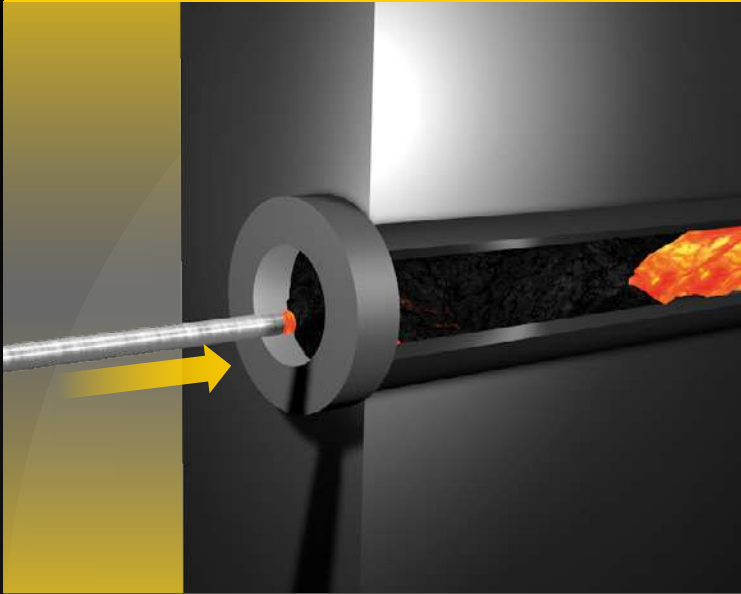
Make sure that there is no molten material that covers the lance, striking it to remove any possible obstruction.

OPENING TAPHOLES

The technical department of Trefimet can provide the appropriate thermal lance for the specific work.

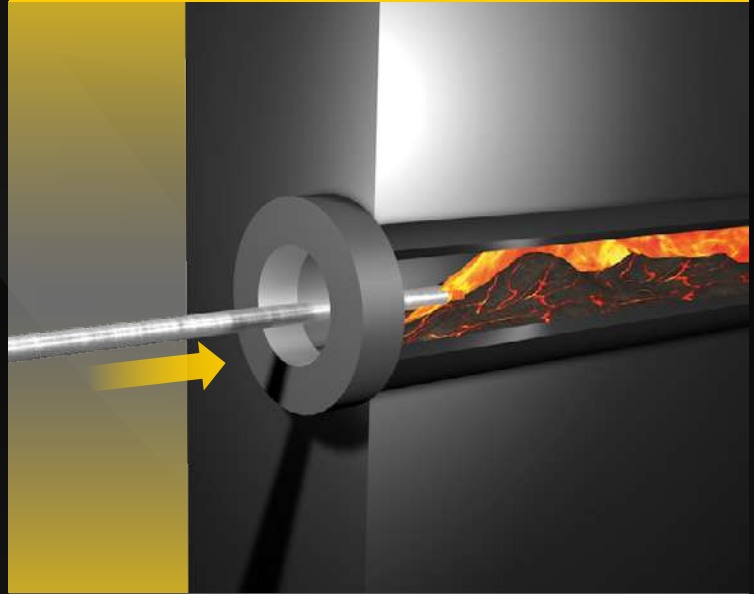
Once the thermal lance has been defined it can perform the following opening operations.

TAPHOLE PERFORATIONS

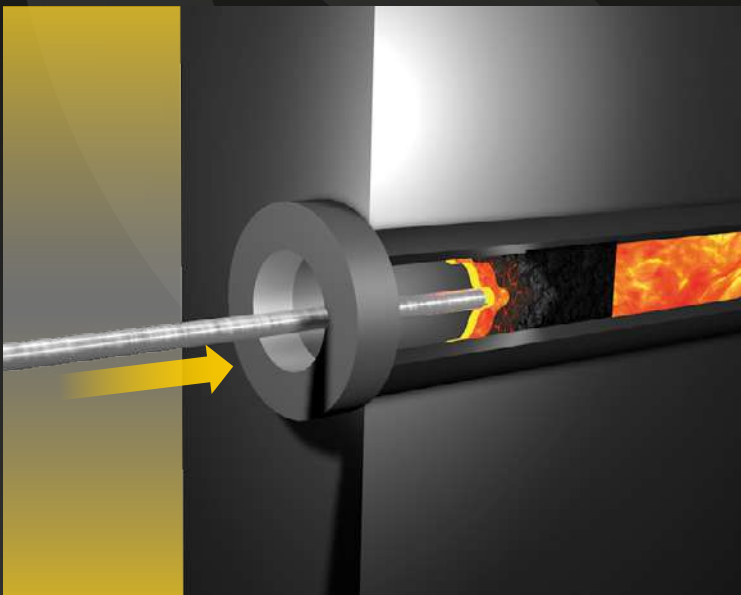


1) The lance is introduced into the taphole until it passes through the mud plug and reaches the liquid material to be evacuated. To perform this operation, place the ignited tip of the lance against the center point of the passage by pressing gently, avoiding to separate from the material to be perforated.

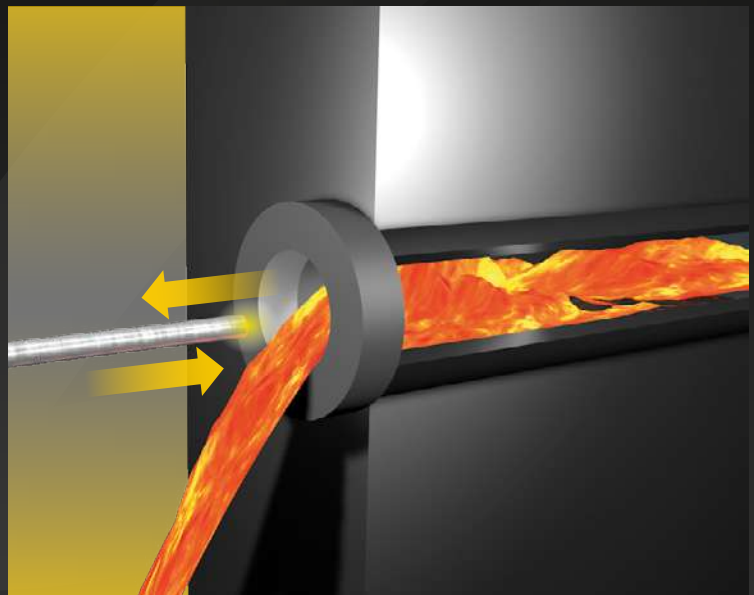
TAPHOLE PERFORATIONS



1) When the flow of material through the passage is reduced by any obstruction of solid material or loss of fluidity by cooled metal, insert the lance until it touches the hard material and push with a gentle yet steady pressure advancing as it perforates the obstacle.



2) Maintain a gentle pressure all the way until you perforate the taphole. Do not make lateral movements with the lance, unless it requires a conical perforation or if you are not using the proper diameter of the lance. Then, it must be removed and placed in different points of the mud plug until achieving the desired perforation.

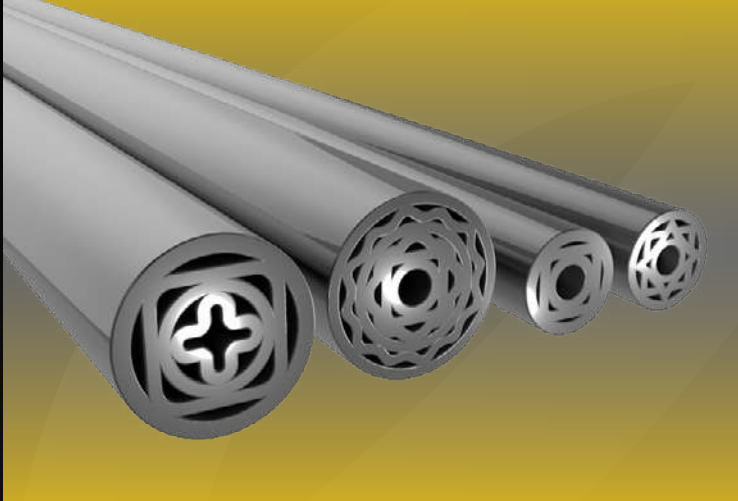


2) If the lance passes through the obstruction and the flow remains low, re-insert the lance until it touches the obstruction and repeat the operation with swaying movements until clearing the passage.

CUT OF MATERIALS

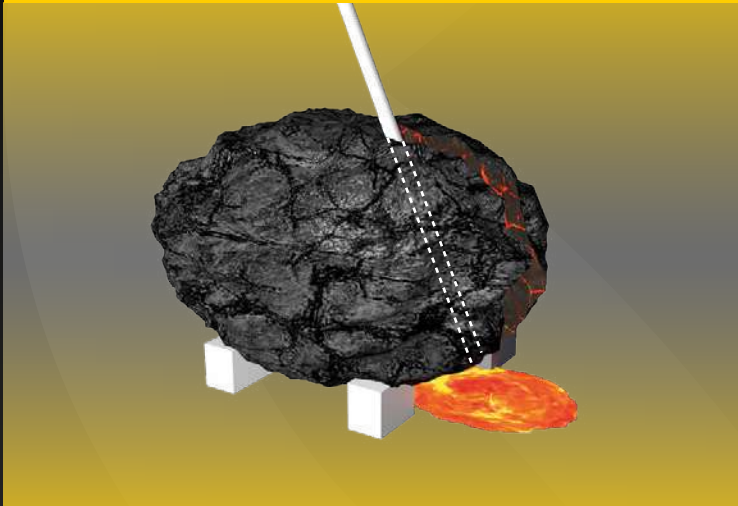
The size & type of lance is determined by the material to be cut and its thermodynamic properties, melting point, specific heat and heat of fusion.

DIAMETER OF THE THERMAL LANCE



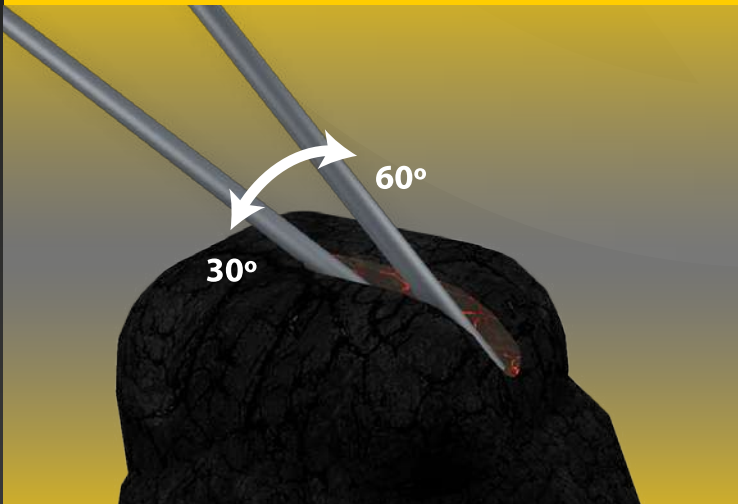
The greater the thickness of the object to be cut, the greater diameter the thermal lance diameter. As long as it corresponds to the same type of thermal lance. With this way, it is possible to evacuate the molten material easily through the cutting channel made by the lance, without the risk that molten material solidifies. It also reduces the risk of lance jamming.

EVACUATION OF REMOVED MATERIAL



Cuts are preferably made from top to bottom as the molten material requires to be evacuated from the channel, or it will be solidified again when cools down affecting the achieved progress. Therefore, it is necessary to make a molten material evacuation channel. **The bottom of the material to be cut should not touch the ground.**

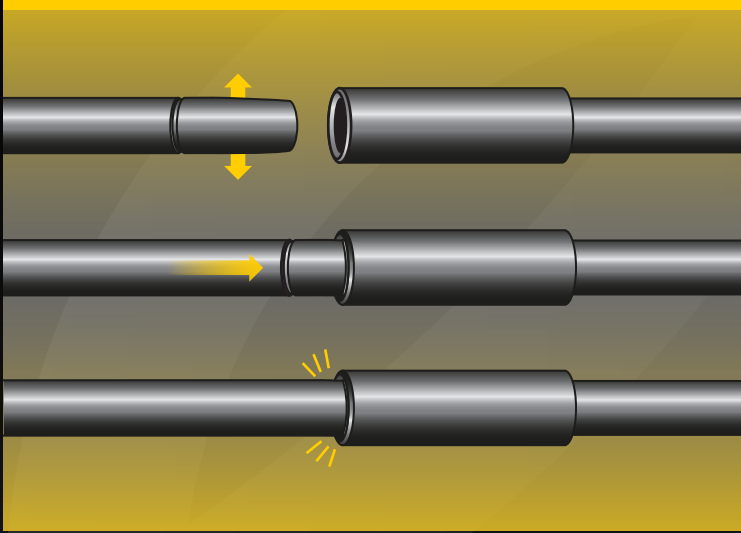
POSITION OF THE LANCE RELATIVE TO THE MATERIAL TO BE CUT



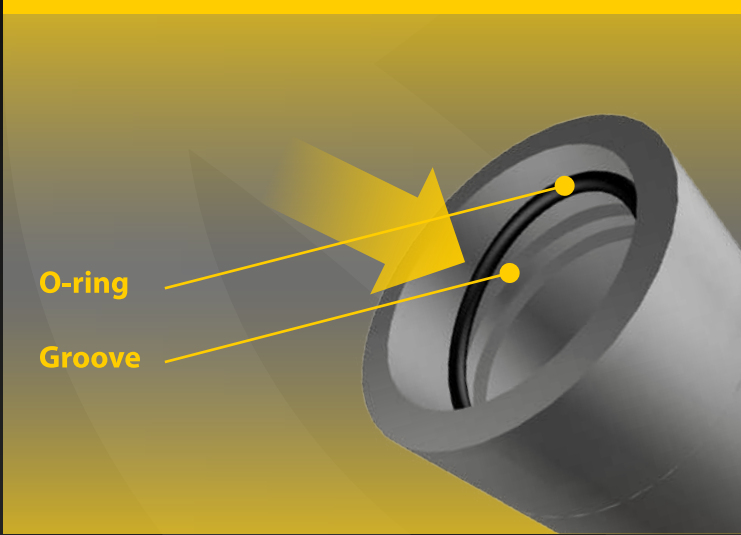
The lance must always attack the material to be cut with an inclination between 30 ° and 60 °, and the operator defines the better inclination.

TREFIMET THERMAL LANCES CONNECTOR - EASY CLICK™

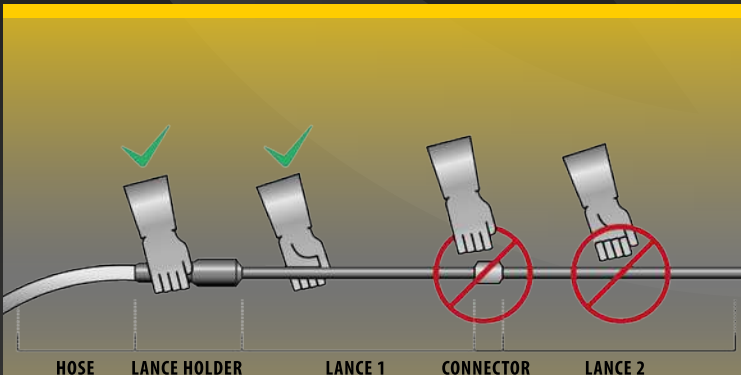
A Trefimet thermal lance will be consumed leaving a remnant piece that will no longer be wasted thanks to the exclusive EasyClick™ connector, an innovative connector that allows fast and easy joining of 2 or more thermal lances without oxygen leaks. Developed and patented by Trefimet, EasyClick™ connector has a coupling system that connects a new thermal lance in less than ten seconds just by performing the following steps.



1) Align the tip of the used lance with the new lance connector. Gently insert the part of the used lance until you feel a "click", now they are tightly connected. Always check the connection by trying to pull it apart or backwards.



2) If the connector does not fit in easily, do not apply force. Disconnect and check for any foreign material or if the O'Ring has been removed from its slot. In that case, just relocate it by moving it into the groove with your finger.



CAUTION: AVOID HOLDING THERMAL LANCE BY ITS COUPLING SYSTEM OR IN FRONT OF IT.

For your safety, we recommend the operation of thermal lances holding them from the lance holder or in between the lance holder and the coupling. This will prevent damage to the lance holder and the coupling.

This EasyClick™ connectors brings efficiency and savings in operation, due to the use of 100% of the lances, without leaving any scrap pieces. It also provides safety and comfort for the operator, not having to crew threaded connectors, as it happens with common pipes or other lances.

