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XPR and HPR mild steel cutting with Air/Air

The increased use of oxygen by hospitals treating COVID-19 patients is resulting in spot oxygen shortages. These shortages are impacting industrial applications such as the cutting of mild steel using Hypertherm XPR and HPR systems. Although, these X-Definition and HyDefinition systems are optimized to provide the best cut quality when using an O2/Air process, it is possible to cut mild steel using an Air/Air process. Please note however that you will see a degradation in cut quality and consumable life. The intention of this communication is to provide you with a mitigation plan in case oxygen is not available for a short period of time.

Important Notes:

- Do NOT connect Air to the Oxygen inlet connection. This can cause internal contamination or damage to the gas consoles, leads, torch, and receptacle. It is also unsafe. The unit will automatically switch to Air/Air when the process is selected.
- Install the appropriate consumables for the aluminum Air/Air process. See the following pages.
- Hypertherm uses A36 grade steel to cut our samples. Speed adjustments may be necessary if using a different grade of steel or if you desire a different surface finish and dross outcome.
- You should expect a higher concentration of nitrogen near the surface. Hypertherm cannot quantify the impact, but extra rework like grinding may be required for weld preparation. A welding engineer would need to conduct further testing and asses further re-work needs.
- True Hole capability is not available.
- You will see a roughly 50% degradation in consumable life.

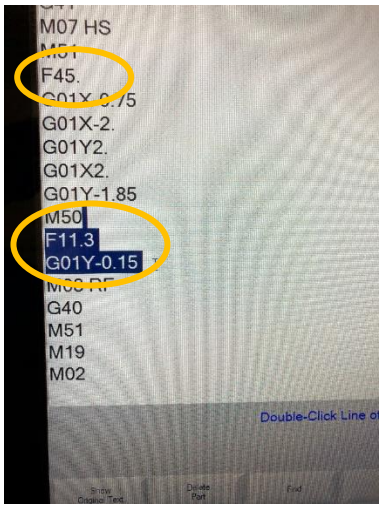
Again, the steps outlined in this announcement are only a short-term solution. You should return to the Oxygen/Air process as soon as possible.

XPR mild steel cuts using a 170A aluminum Air/Air process

It is possible to cut mild steel with the XPR's 170A aluminum Air/Air process with two process parameter adjustments. The adjustments outlined below are the only acceptable process for use on mild steel with an XPR.

1. Make sure to add a lead out for the thickness chosen. The lead-out may not be pre-programmed as part of the code for the 170A aluminum Air/Air process as it is for mild steel processes. Without the lead out, the end of the cut part will have an end divot as shown below.

2. In addition to adding a lead out, you will need to increase the speed at the end of the part, as the normal 170A aluminum Air/Air process is too slow for mild steel, contributing to the end of the part divot.



F45 = 45ipm speed through the cut for 0.75in (~19mm) material

F11.3 = 11.3ipm, typical slow down at end of 170A aluminum Air/Air cut for 0.75in (~19mm) material.

For mild steel, increase the end-of-cut speed closer to the main speed, i.e. 35ipm - 45ipm in combination with a lead out from 1.

Some iterations may be required to optimize the lead out and end-of-part slow down to discover what specific changes yields the best results for your cutting operation. Below are some examples as reference. We also encourage testing to understand what level of post-processing may be required while using this alternative process on mild steel. This testing will ensure the right quality of welds are achieved.

0.25in (~6mm) mild steel cut with an XPR; 170A aluminum Air/Air process

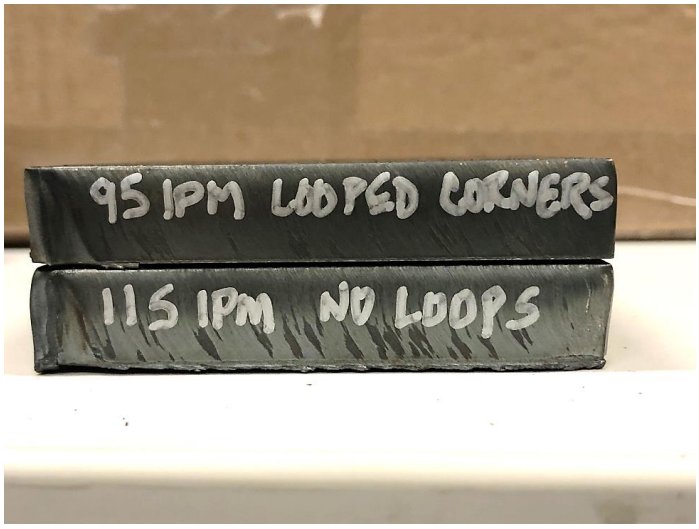
0.25in (~6mm) speeds top to bottom: 150ipm, 175ipm, 190ipm, 210ipm

There is no noticeable difference in cut quality across the range of speeds. The aluminum cut chart found in your XPR owner's manual (809830) calls for a speed of 190ipm. That speed works provided the two modifications noted above are made.

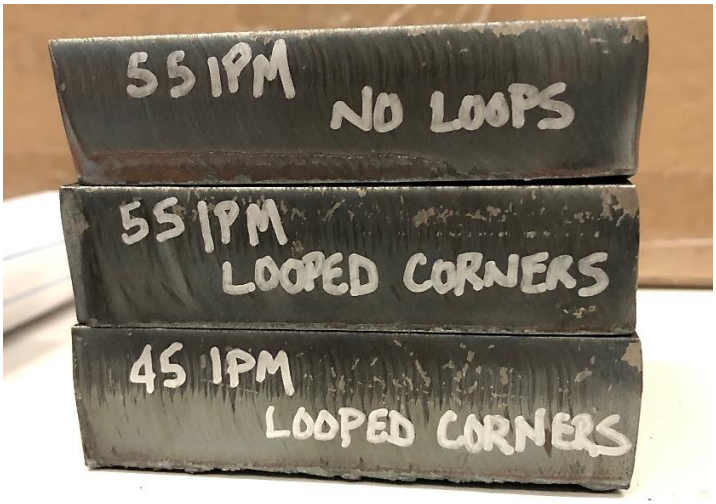
The above image shows the back of the cut parts. As you can see, there is very little dross. Any dross that does accumulate is easily removed.

0.5in (~12mm) mild steel cut with XPR 170A aluminum Air/Air process

The aluminum cut chart in the XPR owner's manual (809830) calls for a speed of 95ipm, and with looped corners has the straightest edges. Looping corners in combination with adjustments 1 and 2 above is also advised. Note the right-hand corners below for straightness comparison.



0.75in (~19mm) mild steel cut with XPR 170A aluminum Air/Air process



For 0.75in (~19mm) mild steel, the aluminum cut chart in the XPR manual (809830) calls for a speed of 45ipm. Increasing the speed to 55ipm yielded less dross and equivalent cut straightness.

Also using looped corners, along with adjustments 1 and 2 is recommended.

Bottom side view of dross on 0.75in (~19mm) cuts.

The left image was cut at a speed of 45ipm. It shows more dross than the part on the right, which was cut at a speed at 55ipm.

The part in the upper right corner of this image shows a part cut at 55ipm. The part is standing up and has no dross as it was all easily removed by hand.

HPR mild steel cuts using a 45A and 130A aluminum Air/Air process

Pictures and observations:

For this exercise we used the 45A and 130A HPR Aluminum Air/Air processes as a baseline to cut mild steel. The cuts were quite straightforward and did not require any adjustments to the Aluminum Air/Air cut parameters. All parameters such as the cut speed, lead-in amount, lead out amount, cut height, etc. are identical to what is found in the Operator's Manual.

This process produced substantially more angularity than the standard O2/Air process. Also, the speed is significantly slower so there is an overall impact to production time. There is some dross on the back of the cut parts as shown below, however that dross is easily removed by hand.

Top to bottom:

0.25in (~6mm) -> 45A AL Air-Air
0.25in (~6mm) -> 130A AL Air-Air
0.5in (~12mm) -> 130A AL Air-Air
0.75in (~19mm) -> 130A AL Air-Air

Notice that there is greater angularity and some dross.

From left to right: The back of the cut parts, 0.75in (~19mm), 0.5in (~12mm), 0.25in (~6mm) 130A, and 0.25 (~6mm) 45A. You can see the presence of dross, however, it is not heavy and easily removed by hand.

For additional information, please contact your local Hypertherm Technical Service Representative.