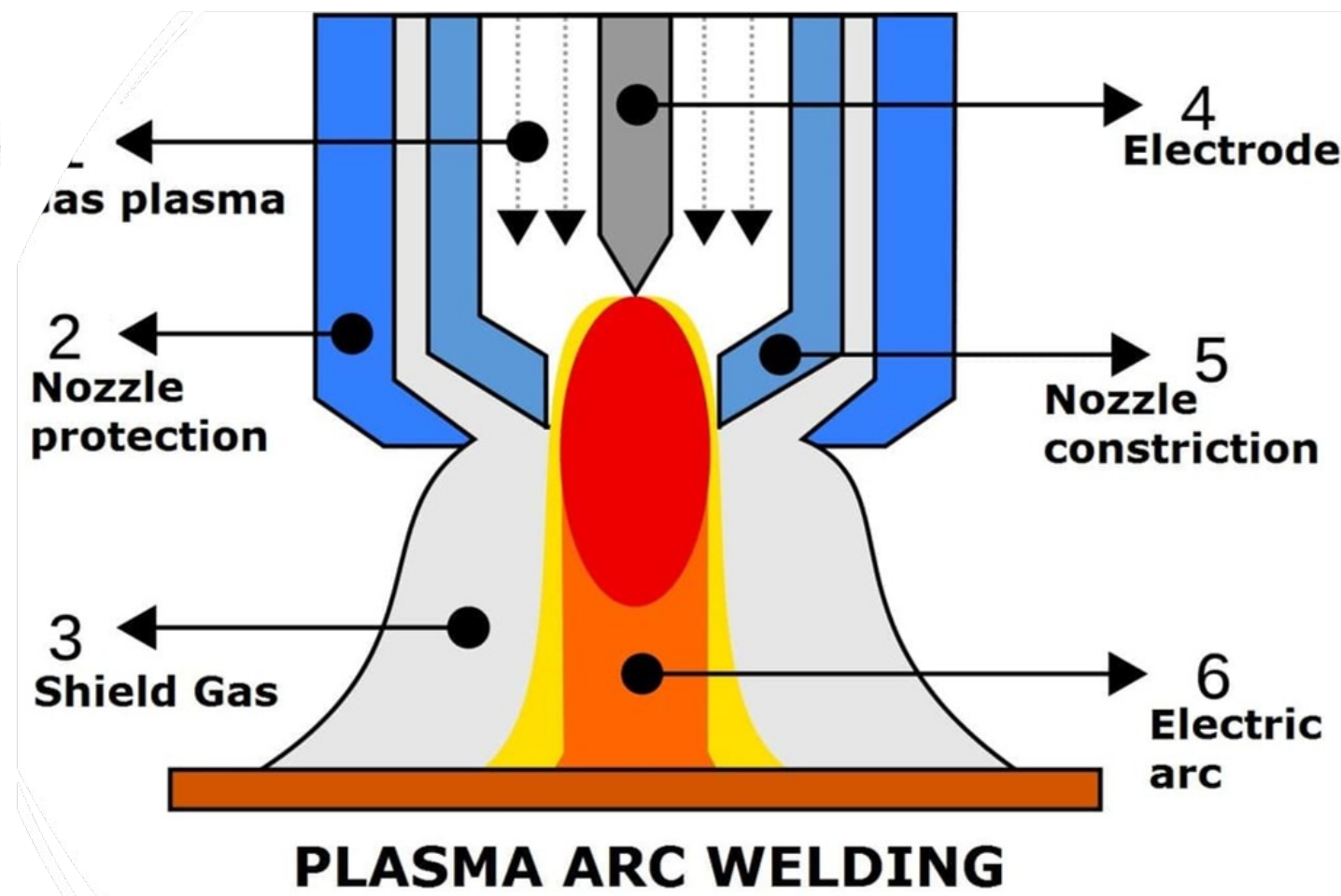
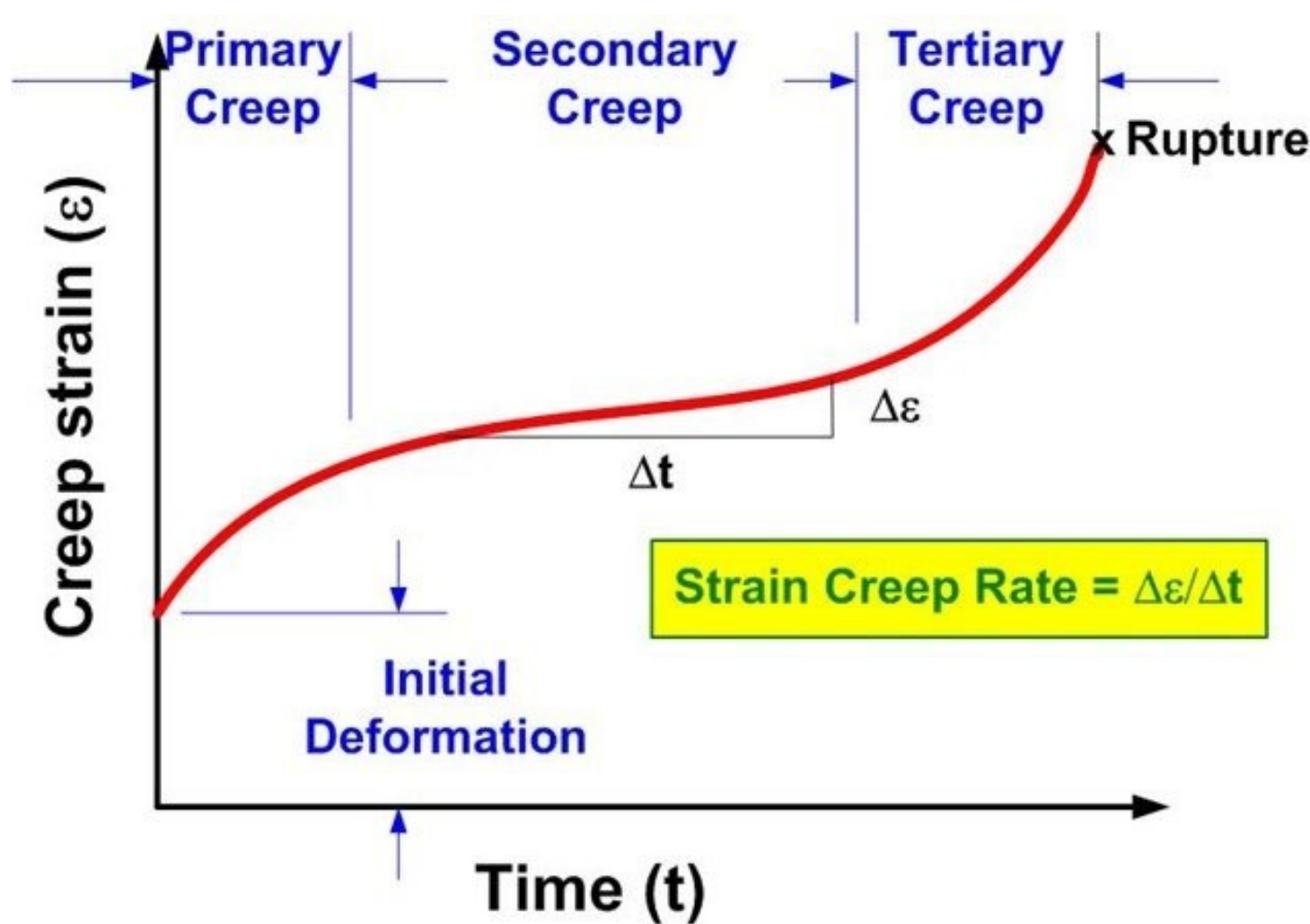


Background



GRX-810 is a 3D printed NiCoCr Alloy printed using Laser Powder Bed Fusion. It is valued due to its high resistance to Creep and its performance in high temperature environments. GRX-810 was designed using a model system, contrary to the more common trial and error style. This saved a lot of money and resources during the design process.

Composition and Processing

Table 1: Nominal composition for base powder GRX-810.

Element	Nominal
Al	0.3%
C	0.055%
Cr	30%
Co	32%
Nb	0.8%
Ni	Balance
Re	1.5%
Ti	0.3%
W	3.0%

Motivation

GRX-810's resistance to creep and oxidation make it an ideal steel for the Aviation Industry. This will save a lot of money as a lot of jet engine parts will no longer need to be repeatedly replaced.



Results & Discussion

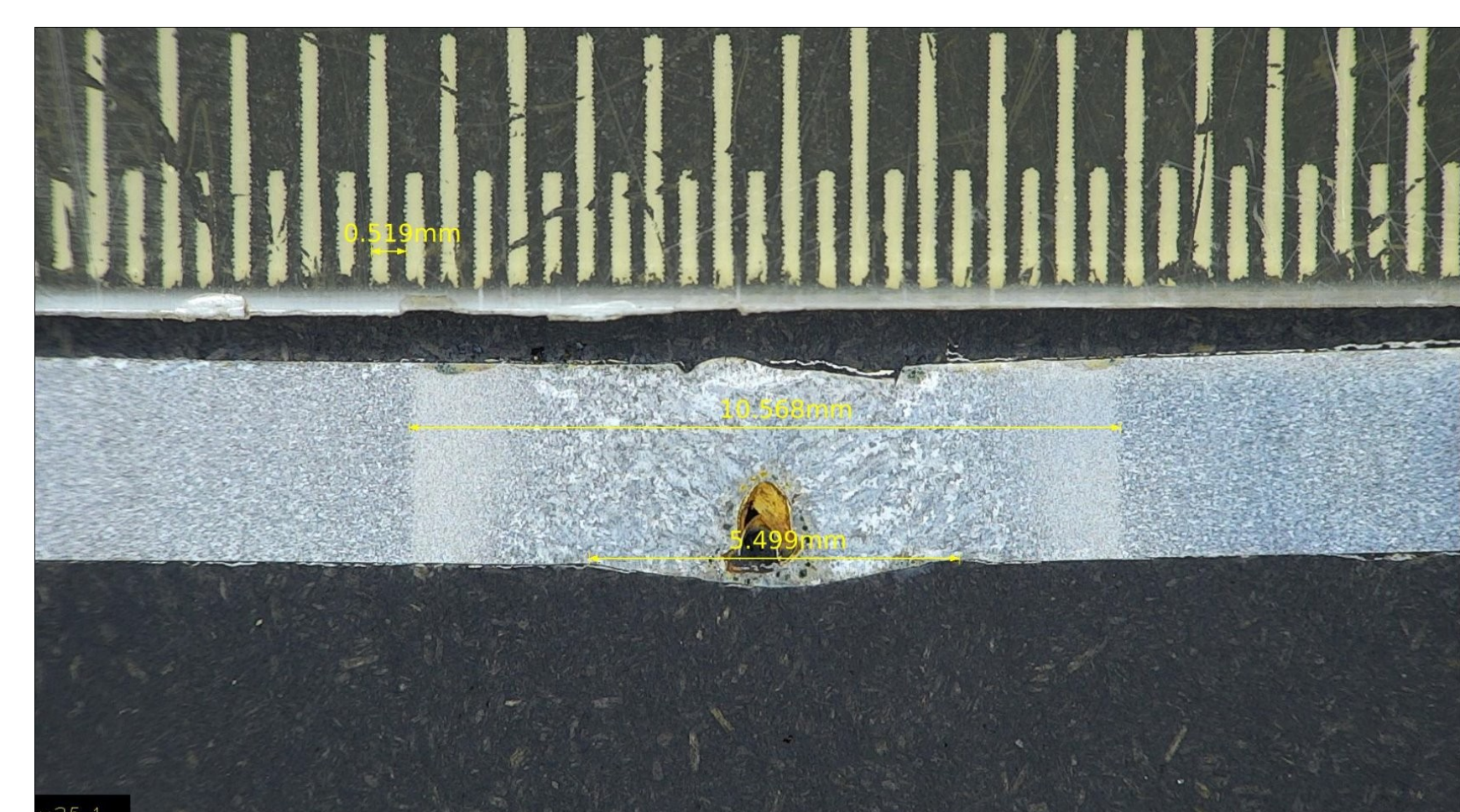
190 Amps blew through the plate and did not join the plates at all. This led to us lowering the amperage to 140 Amps.



140 Amps did not get full penetration, which also revealed that 2 Liters a minute was not enough flow rate.



•160 Amps fully penetrated the plate but did not cut all the way through. These parameters will be used on the GRX-810.



160 Amps Etched with 2% Nital

Objectives & Approach



Objective

Use plasma arc welding to find the most optimal parameters to weld GRX-810.

Approach

Used a Fanuc Robot to run trials on stainless steel the same size and width of the GRX-810.

Started with 190 Amps at 2 Liters per minute.

Then started using a "trial and error" method to find the optimal parameters.

Once the parameters are optimized start implementing the GRX-810 into the welds.

Conclusions

160 Amps at 5mm/s got full penetration, creating a strong weld, which will serve as the starting point for the GRX-810. We also found that 2 Liters a minute is not enough flow rate, so it was bumped to 3 Liters a minute for flow rate.

Future Work

Applying the parameters found to GRX-810 and adjusting them accordingly. Start Experimenting with cooling the welds with liquid nitrogen to accelerate the solidification process.

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