

GTAW: The Effects of Polarity on Penetration and Cleaning

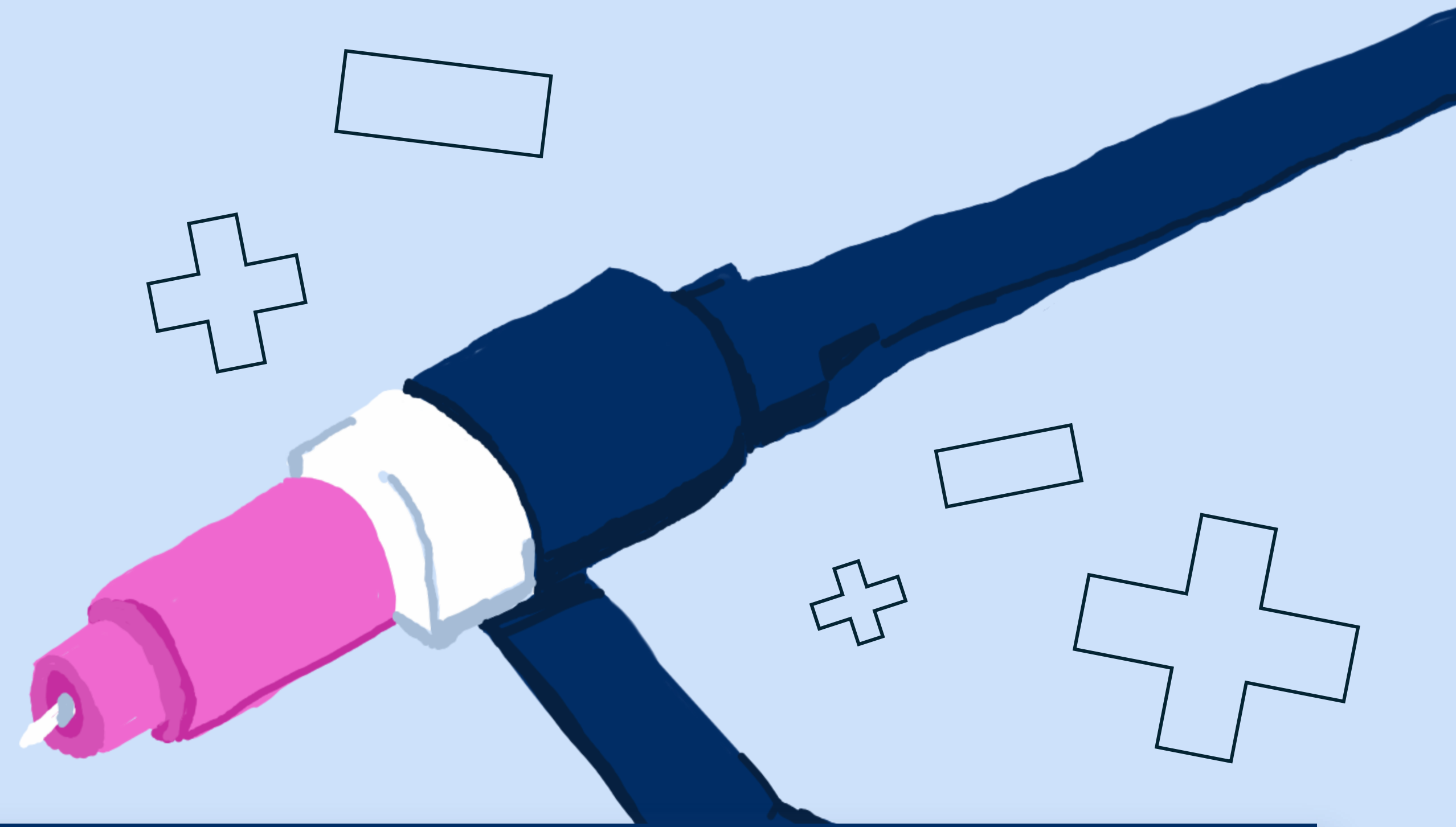
Bianca Llamas – Cerritos College

What is Polarity?

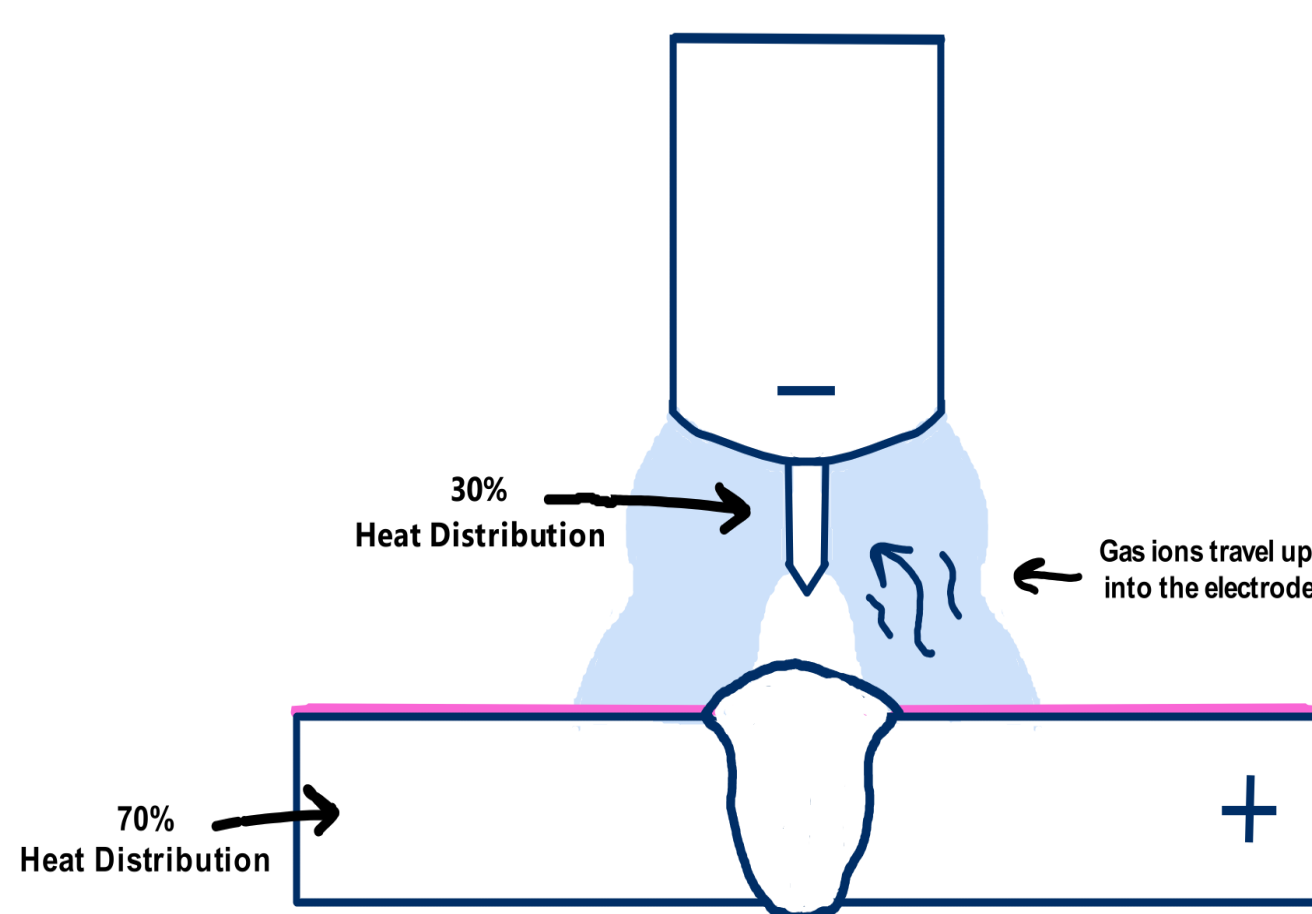
Polarity is the directional flow of electrons in a welding circuit.

Types of Polarity

- Direct Current Straight Polarity (DC-)
- Direct Current Reverse Polarity (DC+)
- Alternating Current (AC)



DC-

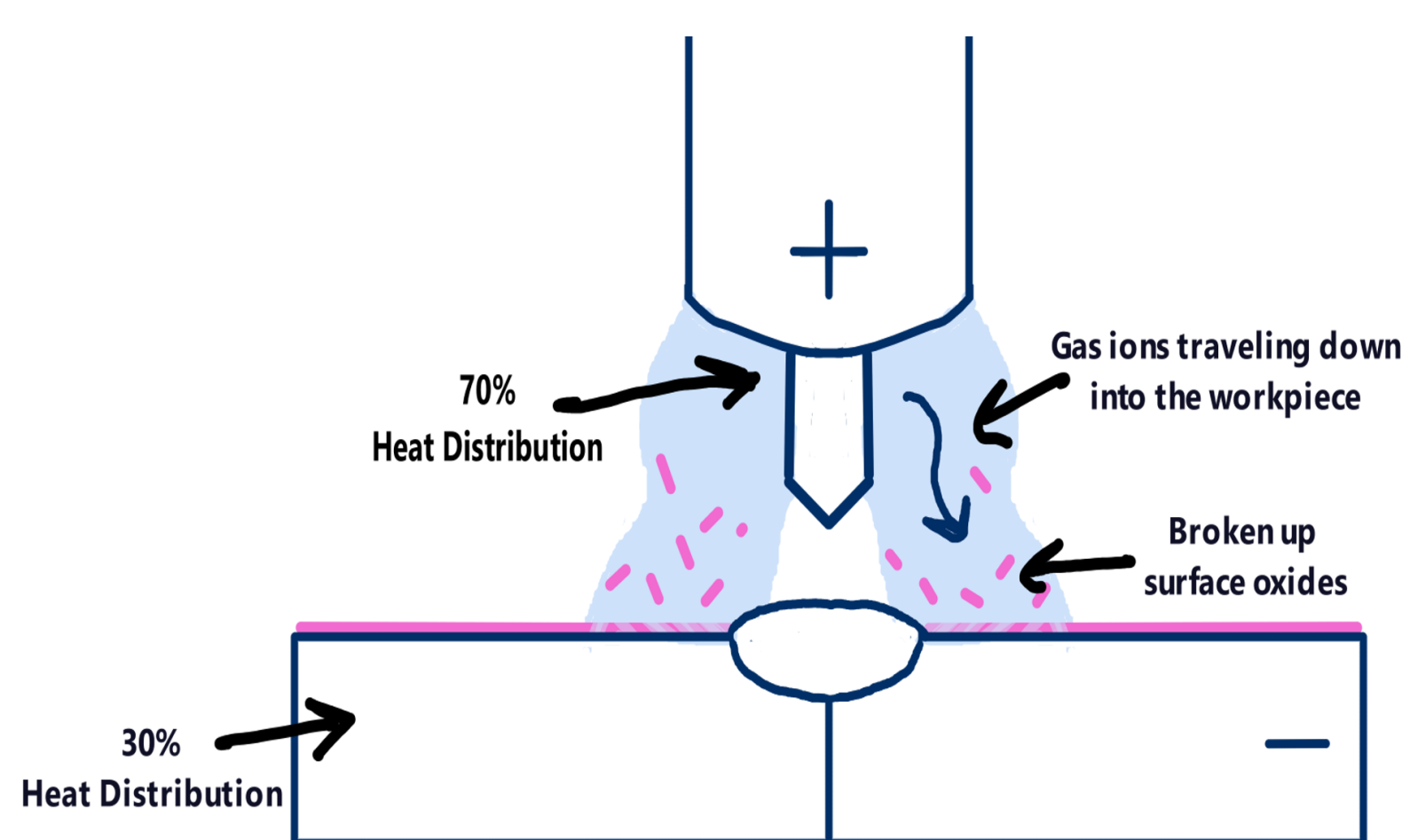


- **Best Penetration**
 - Due to the high heat generated on the workpiece
 - 70% of heat is generated on the workpiece
 - 30% of heat is generated at the electrode
- **No Cleaning Action**
 - Gas ions travel **up to** the electrode, leaving the surface of the workpiece uncleaned

The Purpose of Cleaning Action

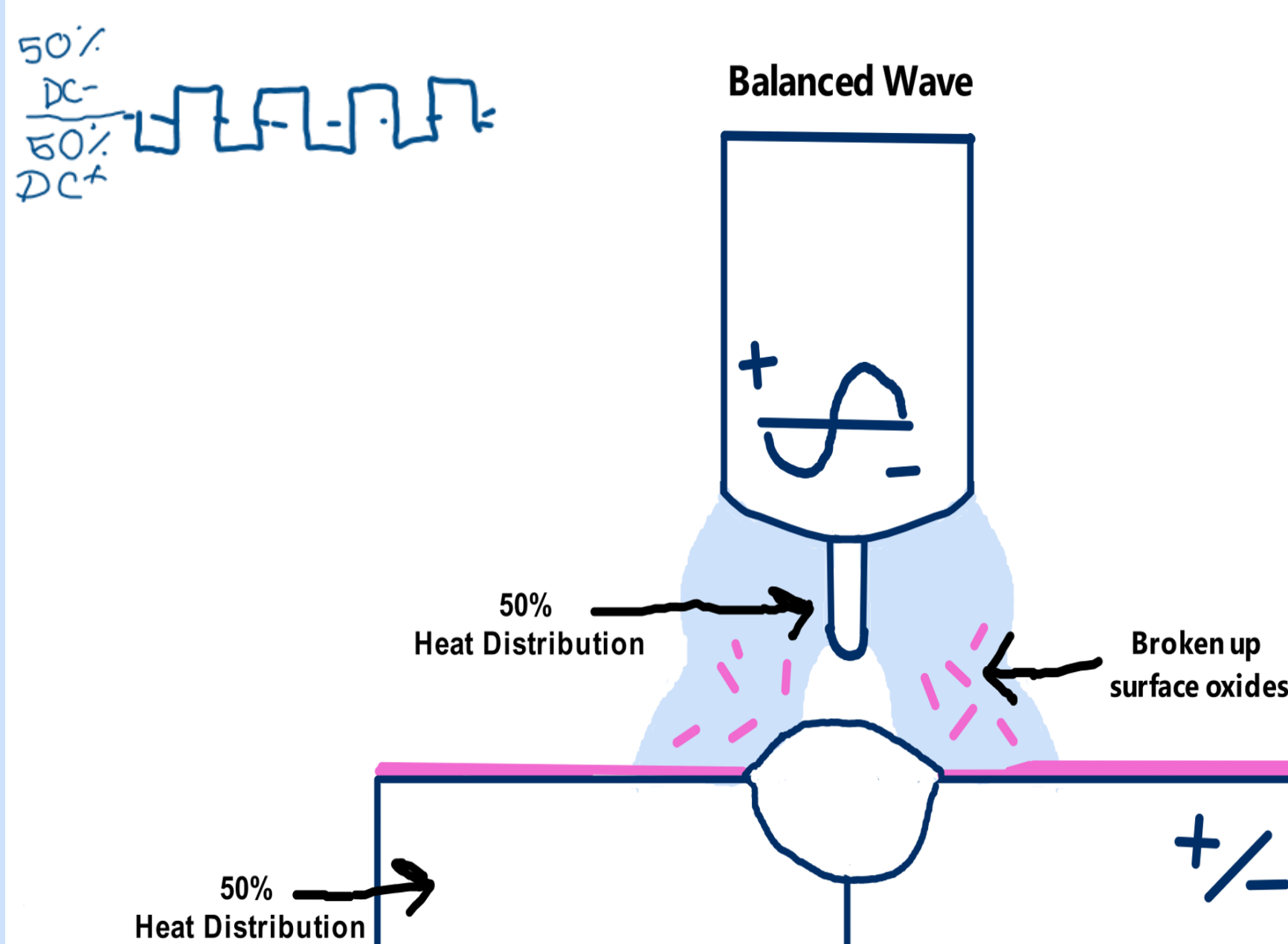
Surface oxides that appear on aluminum and some other non-ferrous metals must be cleaned due to them having a higher melting point than these base metals, making them difficult to weld with unless removed.

DC+



- **Least Penetration**
 - Due to the high heat at the electrode instead of the workpiece
 - A larger electrode is required to handle said heat
- **Great Cleaning Action**
 - Heavy gas ions travel from the electrode down to the workpiece, striking it and breaking up the surface oxides

AC



- **Great Penetration**
 - Due to the negative half of each cycle the penetration is far better than DC+ alone
- **Great Cleaning Action**
 - Due to the positive half of each cycle, positively charged gas ions strike the workpiece, breaking up the surface oxides
- **AC Balance**
 - A balanced wave alternates between DC- and DC+ evenly
 - Adjustments can be made to increase the penetration or cleaning action with an ac balance control setting

Increase DC-
for more
penetration



Increase DC+
for a
Better clean



There's not one perfect combination to use every time. Type and amount of current to use will vary, based on the type of base metal and its thickness.