Air Hardening Steel

Theory: High-alloy heated to above the critical transformation temperature (to a suitable temperature to form Austenite) to add Manganese (Mn), Chromium (Cr), Molybdenum (Mo), Copper (Cu) alloy elements to transform steel materials harder and then cooling through with cold air quenching process.

Metallic Phase Transformation
Quenching process to use stream cold air to cooling process to natural effect transform steel materials harder.

Air Hardening Steel is Game-changer of TIG Welded of Frame

The two steel materials to TIG welded of frame process with completely opposite result.

1: Ordinary heat-treated steel, that steel has achieved through heating in furnace, to do post-TIG welded process on tubes, the temperature at the joint end can reach thousands of degrees, the heat-affected-zone (HAZ) has rapidly though annealing process.
After welding, the tubes came out softened and the sides of the joint (HAZ) where the most brittle and most absorb stress connection place.

2: Air Hardening, that steel has achieved through temperature to form Austenite, to do post-TIG welded process on tubes the rapidly heating localized hardening. **After welding cooled, the tubes rapid cooling process causes the steel significantly increasing hardness than before caused by re-quenching.** The HAZ place been though the rapid cooling for recrystallization annealing (intermediate annealing) of heat treatment process improve hardness and strength.

Deformation vs. Stress Controlling

Ordinary Liquid Quenching (Water/Oil)

Flaw: The Liquid Quenching (Water/Oil) cooling rates different. The surface cooling first and internal in later to caused heating stress relief difference.

Air Quenching

Advantage: Air Quenching cooling spread by air. The surface and internal cooling temperature equal caused tinny heating stress. (High dimensional stability).