BAD WHEEL STRAIGHTENING PRACTICES

Fifteen years ago, few people were providing wheel straightening services. But most of those who did, understood the complications of repairing aluminum alloy wheels and knew what they were doing. Such is not the case today. Poor road conditions and increasing wheel costs have prompted a huge demand for straightening. This profitable opportunity has resulted in a flood of new players and many have no knowledge of how an alloy wheel can be irreparably damaged if proper precautions are not taken. If ***Bad Practices*** are employed, a wheel can be reduced to an unsafe condition quickly and the person doing the repair might be totally unaware of it. The end user is ultimately at risk and by the time they find out, it might be too late.

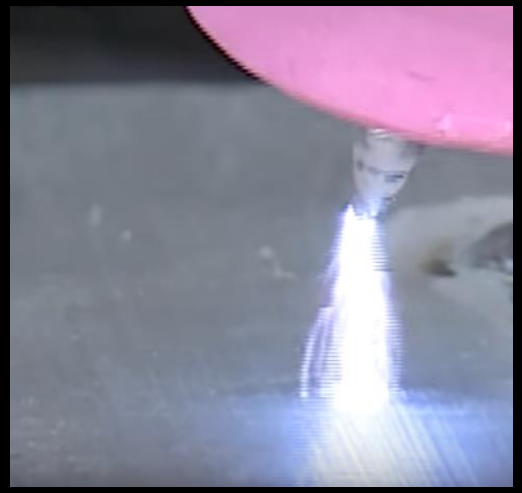
Countless videos can be found of these self-proclaimed “experts” proudly demonstrating their techniques, without the slightest idea that they are causing damage or creating an unsafe condition. This is why the practice has been denounced by every OEM for the last 40 years. The following slides contain some illustrations and explanations of these ***Bad Practices.*** Keep these examples in mind the next time you decide to subcontract a wheel straightening ***because you are liable for what is being done***.

Excessive heating is the most common Bad Practice. When bending impact occurs, the molecular structure of a wheel becomes strained at the bend site. If that strain can be relieved properly, the wheel can be restored to a condition safe enough to pass all SAE performance tests required for brand new wheels. Heat makes the metal malleable. The more heat used, the easier the wheel is to straighten. However, if too much heat is used the heat-treat level (physical and chemical properties) are damaged and the wheel can easily bend, crack, or become deformed, all contributing causes of tire air loss. There is a fine line between safe and unsafe heating.

The most common method of heating is with Oxy-Acetylene torches. The intensity of the flame and how long it is applied is critical. Too much heat for too long weakens the metal and destroys the heat-treat level. To comply with Society of Automotive Engineers (SAE) standards, the application of heat must be monitored and held to SAE guidelines.

Both temperature and time must be considered.

A wheel can be seriously damaged from heat as low as 400 degrees if that temperature is maintained too long. Yet over 3000 degrees of heat can also be applied to a wheel and it can be done safely. Time at temperature is the key. The higher the heating temperature the briefer the application time.



A TIG welding torch can be used to deliver a concentrated 3,000 degrees of heat to a very small area on a wheel. Keeping in mind that aluminum alloy melts at under 1,200 degrees, one can easily see that a TIG torch in the wrong hands could be disastrous. That's why monitoring wheel temperature with an Infrared Thermometer or Tempil stick is the only way to ensure that the wheel is not being damaged.

Oxy-Acetylene torches can also easily melt aluminum and there are numerous videos on the Internet which show these torches being used to heat wheels. Yet you will rarely see anyone monitoring the wheel temperature. Improper use of these torches can quickly heat a wheel to a unreliable level.

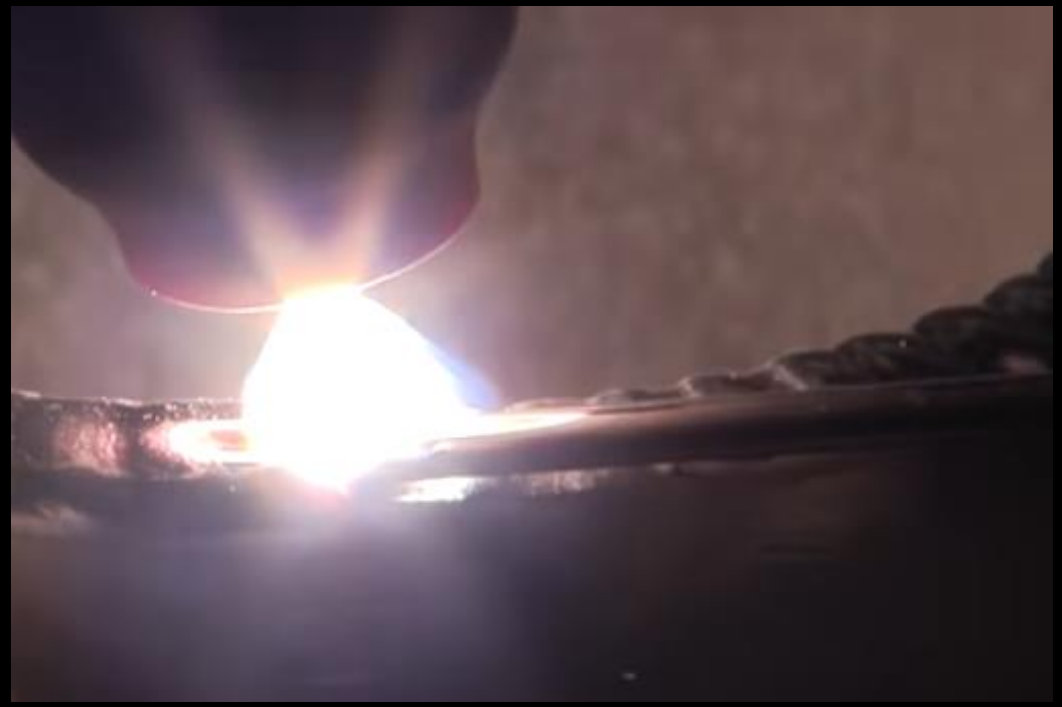
This video on YouTube shows an Oxy-Acetylene torch heating a wheel to well over 700 degrees in just over 15 seconds. At that temperature, the wheel has been annealed and becomes dangerously soft: https://youtu.be/yCCeq6fTdno

Depending on the methods used, a bent wheel can crack during straightening. If the structure of the wheel is damaged to the point of cracking, it is better that it cracks in the repair process than while driving.

A wheel that cracks during straightening should immediately be taken out of service. But all too often that is not the case.

The Internet is inundated with videos of cracked wheels being casually repaired. The practice is regarded as routine and many simply treat it as just another “bump in the road”. And to make matters worse, the Dealer subcontracting the repair or vehicle owner might be unaware that a wheel was welded. The cavalier statement made by the man in this YouTube video is a classic example. Watch here: https://youtu.be/OLTOdHn1l44

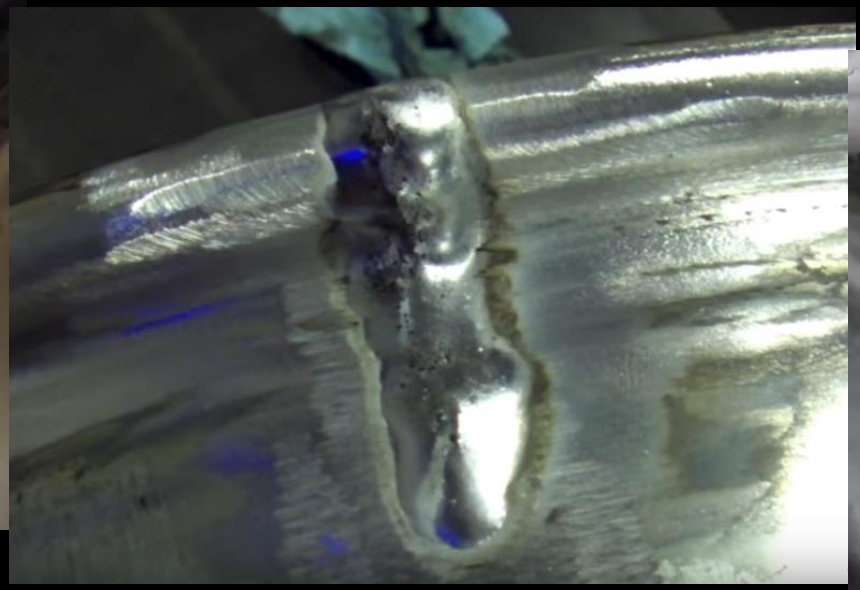
Proper welding methods are critical in the wheel repair process. TIG welding is not difficult to learn and is often one of the main problems in wheel straightening repairs.



Cosmetic TIG welding enhances the beauty of the wheel. It never affects the wheel bead seat and is not a structural repair. If done properly, it will not affect the physical and chemical properties of the metal. Cosmetic TIG welding can be done safely but it is only possible if the welder is experienced enough to understand the metallurgy of an alloy wheel and just how precisely filler material must be added.

Wheels crack for a variety of reasons, including impact, fatigue and even during the straightening process. Only recently has it been discovered that continuing to drive on even a slightly bent wheel will eventually result in a crack. This significant finding places additional responsibility on the service provider to protect their customer from the risk of driving on a bent wheel.

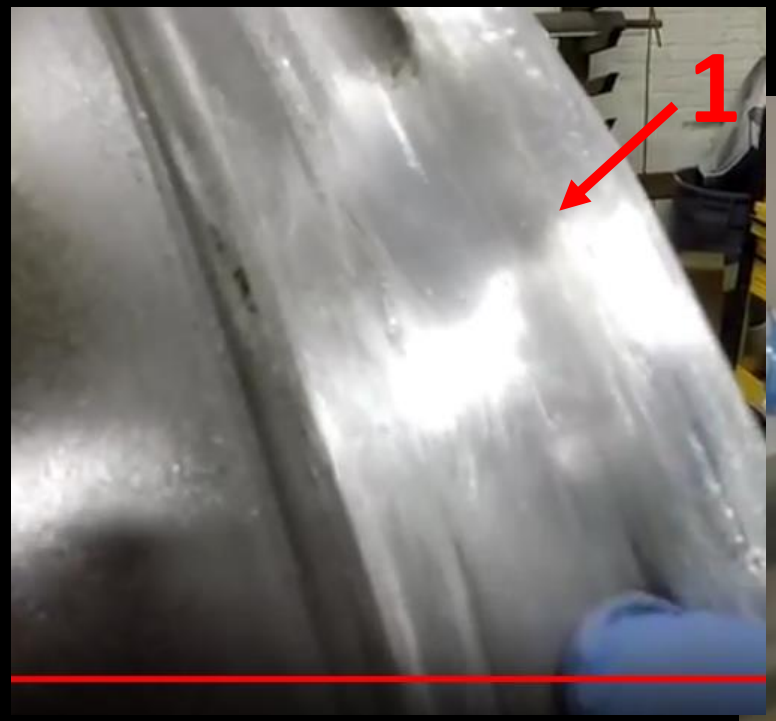
All cracks are serious but some present a bigger problem than others. Some are very small and do not extend into the bead seat. Cracks are halted by drilling a small hole at the base. The crack and surrounding area must then be properly prepared before welding. If this can be all be done by a qualified person without altering the heat-treat level of the wheel or disturbing the bead seat, the repair could be safe. But unfortunately that is usually not the case.

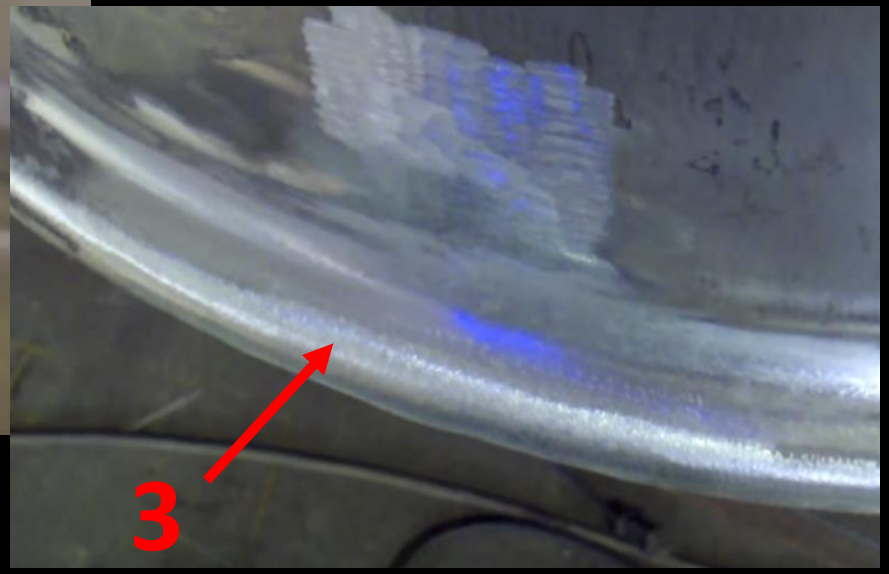


The bead seat of a wheel is a critical surface. The distance between the bead seat and the wheel center bore is vitally important. Precise dimensional and concentric tolerances must be maintained so there is no air loss. To prepare the surfaces for welding, the bead seat around the weld and the inside of the flange must be ground or sanded. These processes in and of themselves could alter the critical dimensions in those areas. And if the heat-treat level of the wheel is altered during welding, irreparable damage will have been done to the wheel and anything else is moot.

Shown here are examples of weld repairs across a bead seat. Even though the quality of these welds might be acceptable, the local dimension of the bead seat has been altered and needs to be smoothed down. The methods used to restore the critical dimension is where additional problems lie.

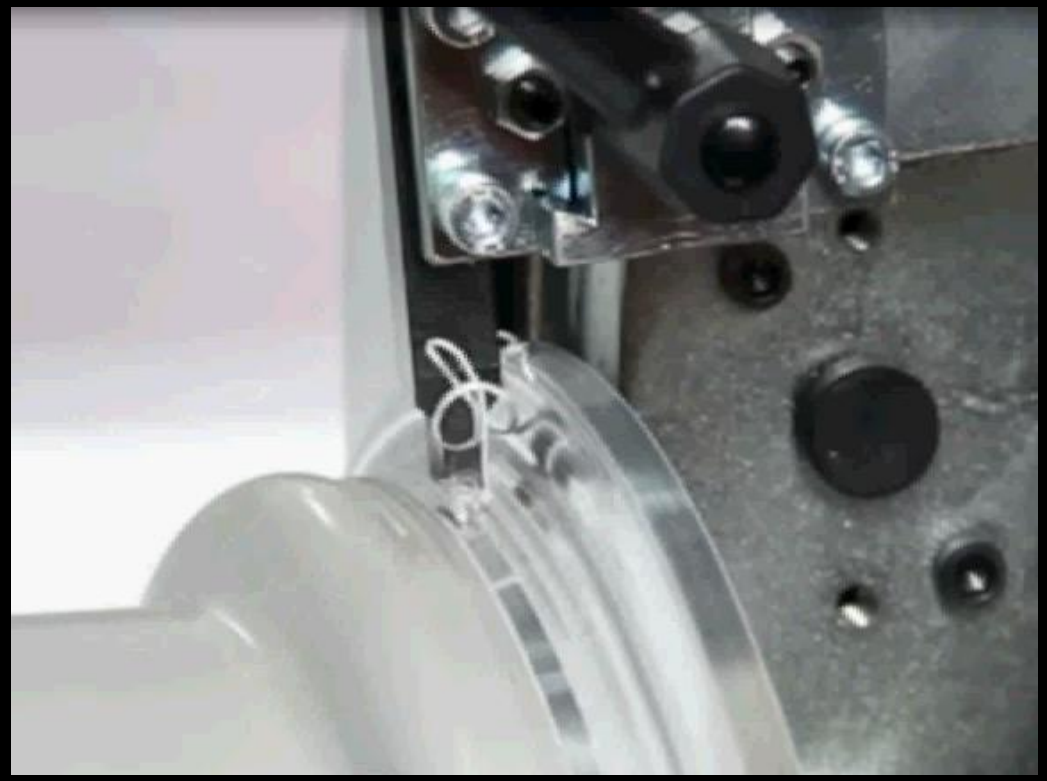
The process or smoothing and blending the weld in the bead seat is usually done by hand with grinding or sanding tools. These methods cannot insure that the surface in the bead seat is returned to the original finish and dimensional tolerances. These photos speak for themselves.



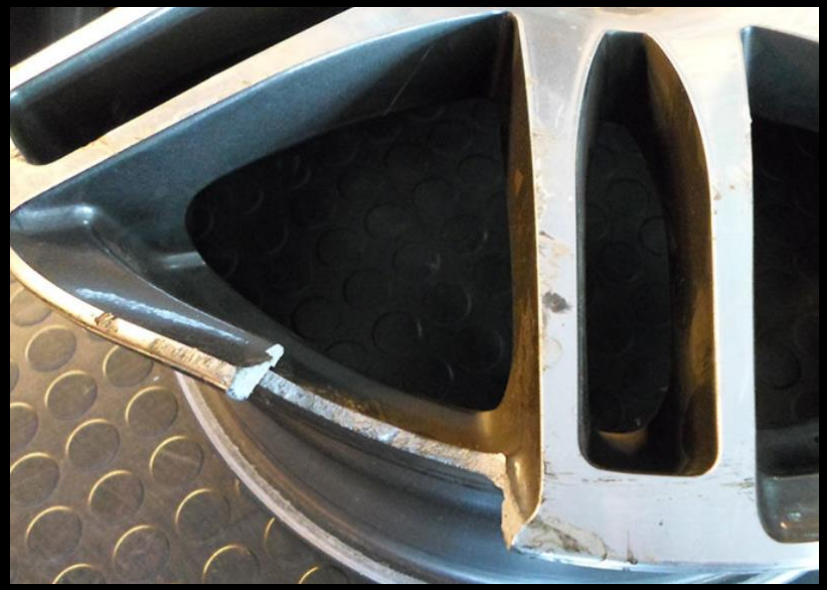


The finished product typical of repairs using methods shown in the previous slide look pretty good. But closer inspection reveals some flaws which could allow air leaks.

1- Low area at rear of flange
2- Depression at base of flange and bead seat
3- Uneven bead seat.



The most dangerous example of wheel repair is shown here. The bead seat is actually being machined on a lathe. Precision turning will result in a smoother and better blended finish than the hand grinding method, but the critical relationship between the wheel center bore and the entire bead seat has been compromised. This YouTube video shows an example of what could happen if the bead seat is machined. And during hard cornering, that tire could actually come off the rim. Watch video here: https://www.youtube.com/watch?v=maLLjFgYWAk



The wheel straightening repair market has become so competitive that examples of extreme practices can easily be found all over the Internet. Shown here are photos of unwise and irresponsible restorations.

Subcontracting wheel straightening is becoming increasingly risky. It involves a critical vehicle component and the best way to mitigate the liability of these risks is to do the repairs yourself.

All you need to do to is to follow the step by step straightening procedure outlined in SAE Technical Paper *2016-01-1573.*