



## PROBLEM SOLVING: Gas Porosity

### Causes:

1. The metal may have been overheated
2. Inadequate burnout
3. Inadequate air flow through oven
4. Flask too hot
5. Scrap re-used too many times
6. Too much oxygen in torch flame
7. Investment residue on remelted scrap

Gas Porosity shows itself as pin holes on the surface of the casting. As opposed to shrinkage porosity these holes are generally round and smooth in nature. Sometimes the holes are concentrated in a layer just below the cast surface, these are invisible in the cast piece but show up after polishing. There are two main reasons for this kind of defect, either a reaction with the investment or impurities that have been introduced into the recycled metal.



### The metal may have been overheated

**Solution** - Reduce metal temperature during casting. If the metal is overheated and introduced into the mould too hot it takes longer to solidify and is in contact with the investment for longer. This can increase the risk of reaction and therefore gas entrapment from the investment. The solution is to reduce the metal temperature and therefore reduce the amount of time the liquid metal is in contact with the investment.

### Inadequate burnout

**Solution** - Increase the time at the top temperature. Any carbon residue that may be left over from the wax could react with the metal on entering the mould and create gases. These gases will then be trapped under the skin of the metal as it solidifies leading to gas porosity.

### Inadequate air flow through oven

**Solution** - Increase air flow and exhaust in oven. Check burnout oven to ensure there is an adequate air supply and exhaust. Drill a few holes in the bottom of the door, make sure that the exhaust vents are open and large enough this will improve air flow, thus improving burnout. If you notice a yellow ring on the investment around the button after casting, a rotten egg smell when quenching, or a dark colour in the investment next to the casting you are more than likely getting a sulphur gas reaction in the oven. Improving the air flow and extending the burnout time will eradicate these problems.



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### Flask too hot

**Solution** - Reduce flask temperature. At elevated temperatures the reducing atmosphere in the oven causes the calcium sulphate within the investment to decompose at the cavity surface, releasing sulphur. When the molten metal is cast into the mould, sulphur dioxide is formed and is absorbed by the metal whilst still liquid creating sulphur gas porosity. By reducing the flask temperature the metal will chill quicker when entering the mould creating a skin which will not absorb the sulphur gas.

### Scrap re-used too many times

**Solution** - Refine metal or only use a maximum of 50% old metal. By introducing re-used metal there is a possibility of introducing old investment as well as other impurities into the melt. These impurities can cause a direct gas reaction leading to gas porosity.

### Too much oxygen in torch flame

**Solution** - Use a reducing flame when melting with a torch. Oxygen levels that are set too high within the torch flame will cause an oxidising reaction of the metal. It is important therefore to make sure that the oxygen levels are moderate. There is also a possibility for the unskilled caster to overheat the metal.

### Investment residue on remelted scrap

**Solution** - Remove old investment for scrap before re-melting. Refine metal or only use a maximum of 50% old metal. By introducing re-used metal there is a possibility of introducing old investment as well as other impurities into the melt. These impurities can cause a direct gas reaction leading to gas porosity.

