

CHOOSING THE RIGHT DIE STEEL



PAUL BRITTON
Vice President
INTERNATIONAL MOLD STEEL, INC.



ARTICLE TAKEAWAYS:

- Understanding die steel grades
- H-13 versus DH31-EX

In today's die cast market you have many different steels to choose from. North American Die Casting Association publishes a list of different types of Hot Works steels to choose from when selecting a material for an upcoming job. The different materials range from Grade "A" to Grade "F." Each grade has a different chemistry or quality that different tool shops might be looking for with regards to their tooling. Quite a few times companies will choose a simple H-13 single melt or double melt material. These types of materials are usually the least expensive types on the NADCA list. Most tool shops are very familiar with these materials; therefore, the learning curve is basically non-existent. But should they be chosen above others because of those qualities? In some instances yes. But when it comes to die life and tough jobs that need a better steel, then no, it would be best to choose something different. Below are 3 case studies of companies that originally chose a double melt H-13 but then through trials, these

companies found something that provided better value and cost savings.

CASE STUDY #1 Automotive Valve Cover Challenge:

A customer approached us to see if we could help their current die situation. The original material chosen for this job was a typical H-13 double melt material. Their current level of production was set at 900-1400 shots per day off of these dies. The original H-13 (44-46 HRC) dies started to show evidence of heat checking between 5000-8000 shots. At this point the level of heat check is acceptable but does need to be watched. Once the dies hit around 13,000 shots, the dies needed to be welded because the heat check was so bad, making the aluminum parts unacceptable.

Then, at around 18,000-20,000 shots the dies needed to be plugged. The cost for this generally runs between \$3,500-\$4000 for plug rework between the welding and the plugging of



the holes in the die. And, the die life is shortened considerably. Once the dies hit 25,000 + shots the dies are nearing the end of their die life.

Solution:

This customer decided it was time to take a new approach when it came to selecting a die steel for this application. The die steel selected was DH31-EX with a hardness range of 44-46 HRC. DH31-EX falls into the Grade "C" category on the NADCA steel selection chart. This material is known for better heat check resistance as well as high toughness especially in larger cross sections.

The trial was set out to be for 3 cavities and cores (Cav #16, #17, #18). They felt this should give them a good indication of die life. The first die (Cav #17) was put into production in February of 2016. The initial results showed heat check starting to occur around 5,000 shots which was similar to the H-13 dies. However, DH31-EX has a much finer matrix than H-13. Once the heat check starts to

occur the material stabilizes and the heat check pretty much stays at the same level and does not get worse. For the past year and a half they have had one minor weld in one area – no other rework has been needed and no plugging of the holes whatsoever. Since October of 2017 the original 3 dies have produced the following parts:

Cav #16 67,522 shots

Cav #17 81,285 shots

Cav #18 39,015 shots

This has saved the customer a tremendous amount of down time as well as money. All future dies are now produced with DH31-EX.

CASE STUDY #2

Automotive Housing Cover

Challenge:

We were approached by a large die casting group to review a couple of issues they were having in the market place. The first issue was to look at different steel grades that will enhance their competitiveness and tool life.

The second was to look at LCC tooling that will provide more competitive tool costs as part of a larger quote package. A review of their lost business opportunities showed that tooling costs were one of the highest factors in not obtaining new business. One of their first trials to combat these issues was an automotive housing cover. The original cover was getting 10,000-15,000 shots before it had to be reworked. This rework increased their overall tooling costs while decreasing their die life.



Solution:

The customer was interested in trying a new die steel to see how it affected die life with regards to this part. The die steel selected for this application was DH31-EX (46-48 HRC). The DH31-EX die is currently at 50,000-60,000 shots with no rework required to date. This customer saw a similar situation as did the customer in Case Study #1. The heat check began to show slightly early on in the die life. This was similar to the other H-13 materials trialed in production. However, it seemed to stop with no further degradation occurring. This saved the customer serious money with regards to eliminating rework as well as the need to build more dies for this application.

CASE STUDY #3

Low pressure die casting

Challenge:

This application involved a low pressure wheel die casting. This customer was having severe cracking issues with their H-13 dies. The cracking was almost always located in the same area in the die. The area in question was a thin walled section that built up a significant amount of heat. The H-13 dies would yield between 8,000-11,000 shots before the dies were pulled from production. The original H-13 dies were hardened to 41-43 HRC.

Solution:

The customer decided to try DH31-EX for this application. The die was heat treated to approximately 38.5 HRC. The die was also welded in the thin wall area. We are not sure what type of weld rod was used. Even though the hardness was below the specified hardness range of 41-43 HRC, and the part had been welded in one area. The DH31-EX was able to almost double the tool life compared to H-13. The total shot count was 20,657 shots before it was pulled out of service. The customer recognized the abnormalities between the two dies and will give DH31-EX another try when this part comes back for production. The customer stills views this trial as a success compared to the original H-13 die.

It's very common to use what you have been using – because it's a safe bet. The NADCA die steel selection chart details many other options that are tested and proven in the field to be cost reducing because they are higher performing and last longer. The next time you are considering using what you always have been using, venture out to do a simple test. You may be pleasantly surprised, much like the three customers above.



Contact:
PAUL BRITTON
britt@imsteel.com