Tailored material solutions for the Indian die forging industry

Especially for large production lots, a high durability of close die forging tools is essential for an economic production. However, the life time of the tool is limited by several factors. The most important once are (1) the material concept, (2) the production route or the mechanical properties respectively, (3) the tool manufacturing process and the (4) forging process itself.
An adequate material selection is often a compromise between toughness and wear resistance. Therefore the material selection, besides others, depends on the type of forging process (press or hammer), the geometry of the forging, the facility for pre-heating, the lot size and the experienced failure mechanism.
The material properties, which are mainly a result of the microstructure, can be tailored by the manufacturing route. With respect to that an adequate hardness level is essential. Especially for large tools/die holders or dies with high surface hardness/toughness requirements a contour hardening process can significantly improve the tool's lifetime.
Furthermore a proper geometric tool design (e.g. between blocker and final dies) is essential to avoid cracking and/or to reduce wear. The wear resistance can often be improved by a surface treatment for example by nitriding or welding operations. With respect to the latter, the tool steel maker's guidelines have to be followed.
Finally a proper control of the forging process itself is important for a long tool life. Especially a sufficient pre-heating through the entire tool is essential to increase the toughness of the steel. With respect to that a moderate and homogeneous cooling is beneficial for a long tool life.
However, die steel concepts, as for example 2714 and 2344, can sometimes not meet the technical requirements for specific applications, also in combination with the above mentioned optimizing potential. With respect to that there is a general trend towards tailored die steels. A positive example is the die steel HIPERDIE®. This steel was developed with a balanced toughness at sufficient hardness. HIPERDIE® has proven be a good choice between the tough 2714 and the wear resistant but relatively brittle 2344.