

Tega DynaPrime lining System – Future of hybrid lining for Large diameter AG/SAG and Ball mills

It has always been a big challenge to design an efficient lining system for large diameter SAG/AG and Ball mills in the mining industry. The conventional steel lining that has been in use for last several decades and mill operators continue to be challenged in handling effectively the ever growing need of mill throughput resulting into higher impacts from bigger ball sizes. Along with the need to design bigger and larger liners to reduce the installation/ reline time. These challenges clubbed with growing mandate of the safety of workers during installation has always been a key concern due to significant manpower presence in mill during installation. Tega composite design lining system- **Dyna Prime** addresses all these concerns and some more.

This paper covers the challenges faced by a large Copper mining operation in Chile operating a large diameter SAG mill with steel liners. The 40' diameter SAG mill processing 4300 TPH was experiencing major downtime due to less reliability of steel liners. Significant liner failures in the Shell liners towards the discharge side of the mill due to severe impact of 6-1/4" balls, resulting in cracked cast lifter bars, frequent bolt breakages, excessive peening and excessive wear on certain parts of the liner. This led to frequent unplanned shut-downs and reduced availability of the SAG mill.

A detailed analysis of the historical pattern of failure along with the operating data was analysed by Tega. This included the study of the parameters, the charge movement in mill, the construction of the liner and the material used. Various computational tools like DEM, FEM, and Fracture mechanics indicated the adiabatic shear cracks on the material due to high impact force on the liner by large ball sizes. It was observed that the metal liner suppliers tried to avoid the situation by using a material with higher toughness, but that resulted into reduction of wear life due to low hardness of the metal. Another issue associated with a more ductile material was cold welding that was produced due to high impact and hence made the liner removal a tedious task, increasing the reline time significantly.

Based on the analysis of these failures coupled with more than 40 years knowledge on rubber compounding, bonding ability of metal and rubber, mill process parameter analysis and lining design development, Tega developed a composite lining design with floating metallic inserts in rubber matrix that offered the best wear and impact resistance to help in increasing the life of the liner by eliminating the failures. Several on-field trials were conducted thereafter to validate the solution and the results achieved were in line with the prediction and the expectation of the plant.

This paper is a journey through the complete process of the study, analysis, solution, validation and in field trials to improve the availability of the mill using the state of art on composite material solution for the toughest application on the largest SAG mill.