Chapter 6
Fuzzy Logic Application in Improving Maintenance in a Mining Company (PMC)

ABSTRACT

At a platinum mining company, the research was based on the root cause analysis technique. The objective was to determine the major causes of failure of the pebble crusher, to estimate between the major crusher failures and provide suitable solutions that included the optimization of the crushing circuit. Major failures were investigated including the breaking of the main shaft, bearing failure, and also entry of tramp iron in the crushing chamber. In solving these problems, analysis of stresses was done using solid works 2015, and condition monitoring techniques were applied using MATLAB 2015 to investigate the development of the crack in the shaft. The results showed that EN 19 has better physical properties than EN 9 and EN 26. EN 19 was recommended for the construction of the main shaft. Crack detection prediction by using MATLAB can be complemented and validated by the use of non-destructive testing.

INTRODUCTION

Platinum is found in nature, in the Earth's crust, in nickel and copper ores with deposits mostly found in South Africa, which produces 80% of the world's platinum. It is rarely, if ever, found in its pure state and has six naturally occurring isotopes (Digby Wells and Associates, 2008).

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Table 1. PGMs on the periodic table of elements

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	**Ru**	**Rh**	**Pd**	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	*	Hf	Ta	W	Re	**Os**	**Ir**	**Pt**	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	**	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Uut	Fl	Uup	Lv	Uus	Uuo
	*		La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
	**		Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

Bold = Platinum group metals

CONE CRUSHER

The major problem currently at the Platinum mine is the cone crusher breakdowns within the production setup. A crusher basically is a machine designed to reduce large rocks into smaller rocks, gravel, or rock dust. These rocks are those ones that have not been crushed by the Semi Auto Genius (SAG) mill. The process is in series SAG and crusher to the ball mill, those rocks above 13mm diameter from the SAG mill are automatically send to the crusher for continuous crushing before they are send to the ball or secondary mill (Telsmith, 2005).

DESIGN OF CONE CRUSHER TO REDUCE BREAKDOWNS WITH FUZZY LOGIC AND CBM AT PMC

A cone crusher is a modified gyratory crusher that has a shorter spindle which is not suspended as in the gyratory crushers but is curved in a universal bearing below the cone (Barry & Napier-Munn, 2006). Cone crushers are used for size reduction purposes. In order to extract the required mineral the ore size has to be reduced for processing. The actual crushing of the ore of the Cone crusher depends with the type of Cone crusher, but mostly size reduction is through compression and attrition. Crushers maybe be classified as stated below:

A crusher can be considered primary, secondary or tertiary crusher depending on the size reduction factor.