

High maintenance: low risk

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Being a capital intensive industry, the cement industry needs an effective risk transfer mechanism to protect assets and interruption losses. They should look for the best insurance strategy to achieve the maximum benefits. A good maintenance programme is an effective tool for optimising fire and engineering insurances. In this article the author discusses the impact of good maintenance in various portfolios of insurance based, on his consultancy experience, prevailing insurance practices, discussion with the experts and past loss experience of the cement industry.

Cement manufacturing is one of the largest mineral commodity industries. The world's annual cement production reached about 2bnt in 2004. The cement industry is very capital intensive with major pieces of equipment such as, pulverisers, dust collectors, electrostatic precipitators (ESPs) and rotary kilns being of high value. Equipment is exposed to accidental risks arising out of fire, explosion and other allied perils and also to unexpected breakdown risks. Such risks not only cause material damages, but also result in severe interruption. Insurance is considered to be the dependable and safe means of risk transfer in case of major catastrophe. With the increased claim ratios particularly in the fire and engineering portfolios in the cement manufacturing sector, insurers exercise caution in underwriting such risks. The cement industry is forced to optimise the insurance coverage by adopting various risk control measures. This article examines the effect of a good maintenance programme in optimising the insurance covers.

Risk profile

The risk profile of a seven-year-old, relatively well maintained, typical cement plant with limestone quarry and Captive Power Plant (CPP) with risk ranking may be presented as Figure 1. A cursory look of the portfolio scale indicates that transit risks stands high in the probability scale followed by fire/explosion and breakdown risks. However, considering the material damage and the interruption losses the severity of breakdown risks or fire risks could be much higher than the other risks.

The loss experience of cement industry based on the 25 major losses

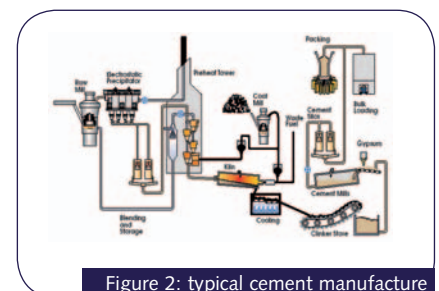
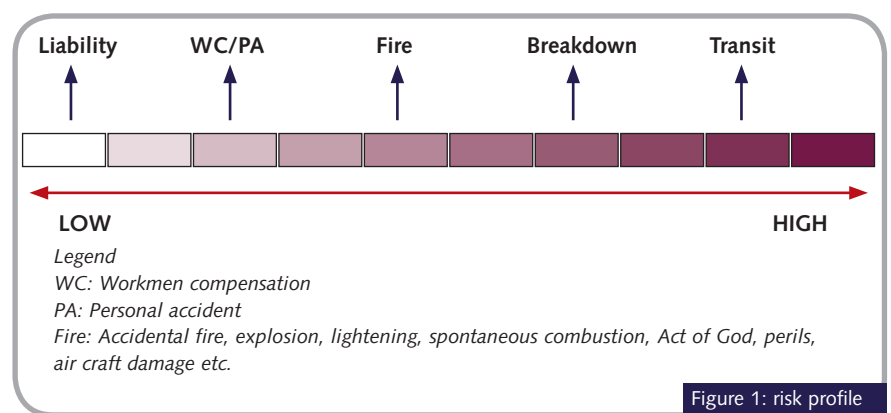
that occurred at various locations of the world (Figures 3a & 3b) substantiates the insurers' perception of risk potential. Among the affected equipment coal handling machinery cause one fifth of the losses. Crushers, ESP and transformer and substations also cause a significant number of losses.

Analysis of individual cases indicates that the rotating parts of equipment like raw mill crusher, kiln, coal mill, cement mills have higher exposure towards machinery breakdown risks. Explosions occur in enclosed areas inside the ESPs, silos, grinding mills, chutes, fuel containers etc. Electrical systems, heating surfaces by virtue of their heat potential draw the attention of the fire underwriter.

Underwriting of fire and explosion risks

Insurers generally offer the protection against fire, explosion, lightening, act of God perils like earthquake, flood, storm, inundation, riot, strike and malicious damage etc, as a single package cover. Some insurers used to offer terrorism also as a package of fire cover, however this practice has been discontinued as an aftermath of 11/9.

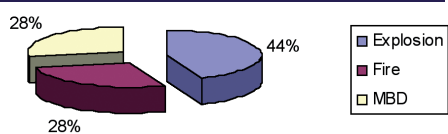
Terrorism risk is covered as a separate cover or add on cover under fire insurance subject to the acceptance and conditions of reinsurers. Similarly spontaneous ignition/combustion that may occur in areas like coal stores can be covered as part of the cover or as an add on cover to the normal fire insurance.



Tariff scenario

In some countries like India, fire insurance is tariff driven and tariff offers discounts on the basic premium that has been fixed for the cement industry based on the past claim experience of the insurers and the risk potential assessed by the regulatory authorities. In such conditions discounts are offered for the good features like provision and maintenance of certified fire protection systems, past claim experience etc.

Figure 3a: past experience – risk-wise break up



Loading is done on the basic premium if the claim experience exceeds the limits specified in the tariff. Though past claim experience can be related to the maintenance of the systems indirectly, there exists a limit on the optimisation of the insurance through better maintenance practices. This is due to the element called probability of occurrence.

Generally, fire insurance depends on the factor of uncertainty and global insurance practice suggests that all property needs to be covered for fire insurance. However the optimisation can be done by means of opting for a higher voluntary deductible based on predictive maintenance systems, under the fire insurance.

Non tariff scenario

In mature insurance markets like Europe, the fire insurance is not driven by tariff. Also, countries such as China and India, which are major cement producers are moving out of the tariff regime. Fire insurance underwriting is driven by market conditions and individual merit of the corporate to be covered under insurance. As the cement industry is capital intensive, none of the local insurers will choose to retain the risk of any major cement company. As they prefer to go in for reinsurance considering the risk potential, the quote by the reinsurer plays a crucial role. Reinsurers check the favourable and adverse features of the cement company concerned and their past claim experience.

The logic of selecting the higher voluntary deductible based on the maintenance practices is more relevant in the open insurance market scenario. The loss potential of the critical equipment of cement industry due to explosion can be reviewed to decide on the special maintenance practices in addition to the routine inspections that are carried out as part of maintenance schedule. Loss history of cement industry collected by Factory Mutual Global Data Sheet of USA (Sheet 6-17) for the past 10-12 years are given in Table 1.

New cement plants in USA employ explosion suppression systems, inerting

and chemical isolation systems for critical equipment. A careful analysis of some of the incidents referred in the above statistics helps in ensuring some of the ‘must- do’ inspections to be included in the maintenance schedule to prevent explosions:

- careful inspection and maintenance of explosion suppression system in cement kiln, coal storage bins etc
- periodical inspection and monitoring of instrumentation used in kiln particularly those measuring moisture of the feed, fuel concentration

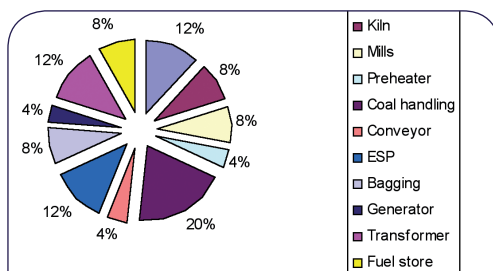


Figure 3b: past experience – equipment-wise break up

- inspection and maintenance of inerting and chemical isolation system in pulveriser
- inspection of static discharge devices in dust collector
- inspection of devices used for trapping the metallic particles before entering cyclones and explosion suppression system
- inspection of explosion venting devices provided in ESP and inspection and periodical maintenance of instruments measuring the explosive gas concentration.

In addition to explosion risks, fire

risks also merit attention in areas like generators, electrical systems, conveyor systems etc. The advantage of maintenance is felt in availing the higher voluntary deductibles, adherence to warranty on maintenance to get attractive insurance coverage as far as fire property insurance is concerned.

Business interruption (fire) losses

One of the major fires that occurred in a cement plant involving the Distributed Control System (DCS) caused a huge loss in terms of interruption losses. The problem of non-availability of a similar system was experienced by the plant due to fast changing technology. The lack of an ‘off-the-shelf’ DCS product delayed the start-up process thereby increasing the business interruption losses.

A well drawn and well implemented maintenance programme can also help optimising insurance cover in respect of business interruption. The insured can choose a higher voluntary excess in terms of number of days and then reduce the indemnity period in case better business continuity plan is ensured.

Engineering insurance

Insurers exercise a lot of care while underwriting the engineering insurances after considering the type, make, condition of the equipment and maintenance practices followed, availability of stand-by machinery, engineering spares along with past claim experience.

Table 1: loss experience of explosions in cement industry

Sl. No.	Equipment	Explosion history
1.	Rotary kiln	20 explosions occurred in the cement industry.
2.	Coal pulveriser	Six in ball/ hammer mills resulted in a loss of US\$2m 10 incidents in pulveriser resulted in a loss of US\$1.6m
3.	Dust collector	48 incidents resulted in a loss of US\$15m
4.	Cyclone	27 losses involved coal dust for a loss of US\$12m
5.	ESP	Four losses in ESP resulted in a loss of US\$2.9m
6.	Coal storage bins	A loss of US\$4.m were caused by seven incidents in storage silos/bins
7.	Ducts/pipes transporting coal	Eight losses resulted in a loss of US\$4.6m

Table 2: non-destructive inspection of mills and rotary kilns in cement plants

Machine component	Inspection area	Inspection interval				Inspection				Type of possible defect	Remedy
		Daily	Weekly	6 monthly	Annually	Visual	Magnetic	Ultrasonic	Temperature		
Cement & raw mills											
Inlet & Outlet Trunnions	Transition radius			Y		Y	Y			Vibration crack	Grind mechanically
Journal Bearings	Journal Surface			Y		Y	Y		Y	Flaw in casting	Grind mechanically with smooth transition
Mill Cylinder	1st welding seam of each cylinder	Y					Y	Y		Vibration crack Incipient crack	Grind mechanically
Mill Cylinder	Transition from manhole reinforcement to cylinder shell			Y		Y	Y			Vibration crack	Grind mechanically and carefully reweld
Gearbox	Tooth profiles	Y				Y				Burring, pitting	Check alignment and realign gearbox
	Bearing	Y				Y			Y	Contact pattern	Check lubricant
Rotary kilns Riding Rings	Contact surface	Y				Y				Graphite block stuck, foreign bodies, pitting burring	Check alignment of roller axes relative to furnace axes grind
Roller Stations	Bearings	Y							Y	Oil leakage, temperature rise	Check lubricant
Kiln Cylinder	Cylinder shell	Y				Y			Y	Out of round, cracks in outlet manifold, hot spots	Measure, check roller stations, repair welds where necessary check cylinder shells temperature
Clinker cooler	Fastenings of riding rings		Y			Y	Y			Cracks originating from fastening welds	Repair welds
	Suspension				Y					Cracks	Repair welds
	Welding Seams	Y					Y	Y		Cracks	Repair welds
	Bolts		Y		Y					Loose bolts	Check bolts for tightness
Gearbox	Tooth profiles		Y			Y				Burring, pitting	Check alignment and realign gearbox
	Bearing		Y			Y			Y	Contact pattern	Check lubricant

Source: Munich Re

Figure 4: front wall of cement mill after carrying out repair with metallock method (source: Munich Re)



The importance of good maintenance schedules and records is felt more effectively if the engineering tariff is market driven. For example Munich Re, the world's largest reinsurance company, having enormous expertise in loss minimisation/loss control recommends periodic Non Destructive Testing (NDT) of critical equipment. This will enable early detection of faults and ensure loss prevention (see Table 2).

Insurers are also particular about the overhauling schedules about the turbines of the captive power plant of cement manufacturing units. In the case of electronic equipment most of the insurers include the warranty on the maintenance agreement in the policy to take care of safety checks, preventive maintenance and rectification of loss or damage or faults arising from normal operation as well as from ageing.

Interruption losses following machinery breakdown

The interruption losses following the machinery breakdown have caught the attention of most cement makers. Similarly the insurers study the facilities on a case-to-case basis before underwriting by reviewing the various engineering and maintenance issues. Considering the higher premium rates insurers allow cement makers to choose the selected equipment for this cover unlike fire insurance cover where insurers insist that all machinery in a block are to be included in the cover.

Underwriters take the following factors into account for each equipment in case of breakdown and interruption losses:

- age of the machinery
- relative importance with respect to total gross profit
- reserve capacity (Availability and number of stand-by machinery)
- availability of critical spare parts
- number of shifts the machinery is in operation in a day
- origin of the machinery.

In addition, insurers consider the quality of maintenance, general loss minimisation, indemnity period limits and time excess, claim experience for offering rebates in the premium. Rebates for quality of maintenance, are assessed on:

- If the risk has effective and competent management?
- If the risk has the above and has effective supervision and maintenance programme for machinery?
- If the above are complied, if the staff are highly qualified?
- If in addition to the above the site has extensive repair facility?

Under the heading 'general loss minimisation', the following factors are also applied:

- presence of preventive maintenance programme
- presence of preventive maintenance programme plus presence of inventories for critical spares
- presence of preventive maintenance programme plus presence of inventories for critical parts plus inbuilt fire protection for critical machinery.

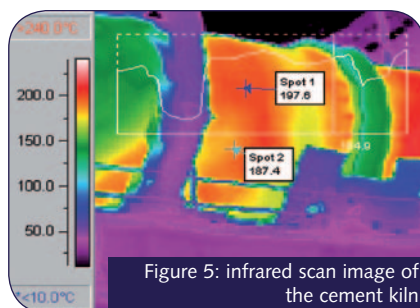


Figure 5: infrared scan image of the cement kiln

Though the underwriter carries out subjective assessment of these factors after inspection of facilities and discussion with plant officials, cement makers can better convince underwriters if they align their maintenance techniques with international standards on maintenance. For example IEE standard 625 drawn exclusively for cement plants may be adopted in case of maintenance of electrical equipment. Predictive maintenance practices like Infrared scanning (see Figure 5) to identify the hot spots in the transformers can help the cement makers get better rebates.

In addition to the above direct benefits, better maintenance also helps to minimise the minor claims as the losses during the compulsory excess indemnity period has to be absorbed by the cement plants

concerned. The lesser indemnity period can be selected to minimise the insurance costs.

Maintenance - a tool in insurance strategy

Prudent insurance practices identify the loss potential in various portfolios and place them in a three layers of the pyramid (see Figure 6) based on the risk acceptance levels of the company. The lowest layer represents predictable losses which are small in size but frequent in occurrence. The middle layer represents those which are less frequent in occurrence but greater in severity. The level of severity is defined as losses which will interrupt operations and place a strain on both cash flow and the ability of the business to meet its commitments. The upper layer of catastrophic loss are relatively rare occurrences but the severity is on such a scale that the viability of the enterprise is threatened.

Prudent insurance will cover the top catastrophic layer and cover the middle layer partly and retain the bottom layer with them. High standards of maintenance will increase the bottom layer and reduce the portion of the middle layer to be insured.

Conclusion

Higher maintenance standards in the cement manufacturing units not only support the production process, but also help to optimise the insurance. They allow companies to retain higher levels of risks; result in a reduction of premium outgoings; ensure a better cover from insurers; help to ensure availability of funds in case of crisis. The cement industry can align maintenance practices with the practices and benchmarks suggested by OEM, internationally accepted standards, reinsurer's guidelines and codes prepared by tariffs, if any.

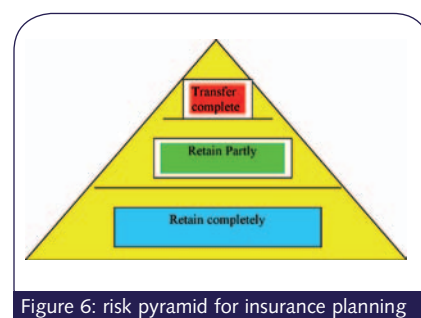


Figure 6: risk pyramid for insurance planning