

4B Braime Elevator Components Ltd 'Watchdog Elite' system brings 21st Century protection to a veteran ship-unloader



The worldwide manufacturer of Material Handling and Electronic Components, 4B Braime Elevator Components Limited, based in Leeds UK, has supplied its state of the art condition monitoring equipment to one of two veteran ship-unloading systems located at the Port of Tilbury on the River Thames. The Port is London's major gateway, handling significant levels of diverse cargo including the importation of paper as the UK's leading port, containers, grain, and various bulk handling facilities, all of which are handled at a number of berths both in dock and on river facilities. The Port's Grain Terminal facility handles around 1.5 million tonnes per year, making it one of the biggest in the UK.

The ship-unloaders, in the form of Marine Legs are the main component of two rail-mounted, mobile Marine Towers installed on the quayside in the 1960's. Based on the then well known North American 'Great Lakes' design, the Marine Towers are quite unique within the UK. Although the equipment is over 40 years old and has, since installation, handled many millions of tonnes of grain, it is still in excellent working condition and is a key element of the grain operations at the port.

Following a major overhaul of one of the Marine Legs in 2003/2004* it was decided to bring the condition monitoring right up to date and the 4B Braime Watchdog Elite system was chosen to be installed on the Marine Tower.



* Marine Leg overhauled by Stock Redler Ltd

The Marine Leg is an extremely heavy duty, purpose built, bucket elevator; designed to be deployed into a ships hold in order to dig into and unload grain cargos to shore. Raising and lowering of the leg, together with luffing, is achieved through a winch and rope system controlled by an operator in a cabin mounted high in the Marine Tower. The 35 metre long Marine Leg elevator operates at a capacity of 860 tonnes per hour, is fitted with 4B Braime HDPE CCS elevator buckets bolted to a continuous 1120mm wide belt and runs at a speed of 3.5 metres per second. Although 4B Braime Watchdog Elite elevator monitoring systems have been around since 1984 and over 2000 systems have been installed, this is the first to be fitted to such a mobile device.



The open-cage elevator boot showing the triple row 4B Braime HDPE elevator buckets

The Watchdog Elite system

So what is the Watchdog Elite system?

Fundamentally all Bucket Elevators are at risk during normal operation, regardless of the product being conveyed, because of a number of issues. These include possible bearing and drive faults, misaligned head & tail pulleys, belt slipping & rubbing and bucket damage & rubbing. Together with the potential for inlet & outlet chute blockages common with any conveyor and the prospect of poor maintenance and housekeeping due to inaccessibility or lack of personnel, it is clear why comprehensive monitoring solutions are necessary. If, in addition to this, the product being conveyed is combustible or even explosive then monitoring is absolutely essential! The installation cost of the system is



insignificant when compared to the consequences if workers, plant and equipment are not adequately protected and a failure occurs.

The Watchdog Elite effectively mitigates these risks by constantly monitoring a number of conditions. These include belt speed, belt alignment, bearing temperature, pulley alignment, blocked chute detection and acceleration. Up to 4 digital and 6 analogue parameters can be monitored and all data is collated at the Watchdog Elite Control Unit and monitor (shown above). The Control Unit is usually mounted adjacent to the conveyor or is sometimes positioned in the operators control room. Capable of running on voltages ranging from 12V DC to 240V AC, the IP 66 rated unit has a LCD screen that displays machine status messages (available in four languages), and a super-bright LED display that shows belt speed. Calibration and set-up parameters are accessed via a password and front panel touch buttons. An optional PLC interface is available.

At Tilbury the following conditions are constantly watched;

Belt under speed and misalignment are monitored by WDA High Power sensors which detect moving ferrous material, in this case bucket bolts - since non ferrous elevator buckets are being used. This is a non contacting extended range sensor, designed to detect targets which are up to 100 mm away. Sensors mounted either side of the Marine Leg casing monitor belt alignment.



Alarms for under speed are set at > 10% for 180 plus seconds and immediate shutdown at > 20%.

All four main conveyor shaft bearings are monitored for temperature with trips set at 80°C and alarms for 180 seconds and real-time readouts are given from 50°C - 120°C.

Blocked chute detection is provided in the infeed chute by the installation of a Binswitch capacitance style sensor that can detect plugs. All Watchdog Elite systems are approved for use in hazardous environments including ATEX Zones 21 and 22 in Europe, CSA in the USA and Canada and IECEx on a worldwide basis and the WDA sensor is approved for use in ATEX Zone 20. All the sensors employed have been developed by 4B Braime over the last 25 years and are renowned for their ruggedness and reliability.

The system at Tilbury has been installed since 2004 and has, to date, been constantly reliable – even though most components are constantly exposed to an unforgiving marine environment. No components have been replaced during this period. Over the six years a number of potential incidents have been avoided due to the early detection and quick response capability of Watchdog Elite. These occur maybe three or four times per year and are mainly due to belt misalignment. This has given the operator the opportunity to re-align the elevator belt without incurring further damage. Whilst the Watchdog Elite is a ‘Guardian’ system, constantly monitoring for a change condition indicating a potential performance failure, the Port of Tilbury actually use the information in a quite sophisticated way. Andy Lamb, Engineering Manager at the Tilbury Grain Terminal, explains; - *“When the Watchdog gives us a first indication of belt slip and raises an initial alarm, we use this as a ‘trigger point’ to deploy our planned maintenance scheme. There is a strong correlation between that very early, slight ‘out of order’ condition and the timing of a service. By doing this our maintenance regime is tied to hours of machine usage not absolute time and therefore we only service when necessary. This saves valuable manpower resources and obviously money”.*

Such has been the success of this installation; the customer is now looking to replicate it on the second Marine Leg and in addition has now decided to extend the Watchdog Elite system philosophy into the main silo block itself. The technology will be the ‘big brother’ of Watchdog – the T500 Elite. This system is

capable of monitoring up to 256 inputs every 4 seconds and has full integration capability with the on-site PLC set up.

*Marine Leg overhauled by Stock Redler Ltd

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