



## ***Cases of Success***



### **PA-01 & PA-02**

***Documents referred to actual applications which had successful identification of failure processes using predictive analyzers PA-01 and PA-02.***

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**Company: Universidade Federal de São João Del Rei**  
**Address: Rua Frei Orlando, nº 170 – Centro – São João Del Rei – MG**

**Person in charge: Lane Baccharini**  
**Position: PhD Professor of Electrical Engineering**  
**Department: Industrial Engineering Faculty – Electricity Department**

**Application: Lab Tests – Simulation of real situations**



**Results: In September 2006, KRON entered into a partnership with UFSJ Electrical Engineering Department (DEPEL) to perform a series of tests with the PA-01. In Brazil, DEPEL is a benchmark for failure analysis by means of electric signals and it is represented by Professor Lane Baccharini, PhD.**

**A joint effort was developed for two months in DEPEL facilities. During the tests, the PA-01 underwent the following situations:**

- Rotor misalignment**
- Power grid imbalance**
- Load variation**
- Insulation loss**

**Below there are excerpts of the article “Detection and Diagnosis of motor failures by means of electric signals” published in the Petro & Química magazine describing the tests carried out:**

**“Tests were performed for power supply network failure, mechanical failure, and insulation loss. After each test with PA-01 failure detection, the known condition was restored. For every situation, analyzers signalized the motor operation condition.”**

**“Another important feature of the PA-01 is the capability of analyzing the quality of power supply network, power surges between phases, and the motor overload condition. The three PA-01 equipments diagnosed the motor for the various tests performed”.**

**“In addition to achieve the purposes established for this stage, the project showed the importance of University and Company partnership to bring bilateral knowledge to both sectors”.**

**As we see, PA-01 was approved in the tests performed.**



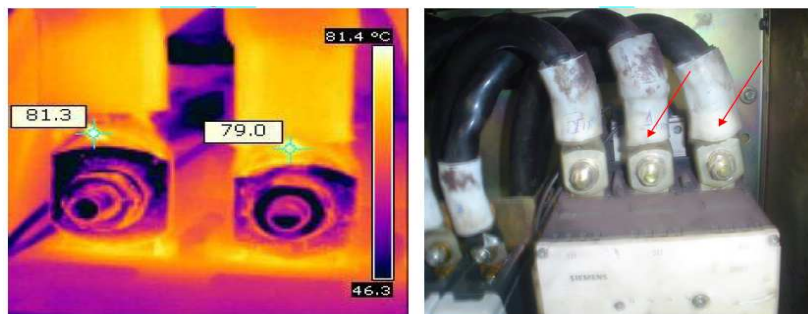
**Company: Samarco Mineração S.A. – Ubu Unit**  
**Address: Rodovia ES 060, Km 14,4 S/N, Ponta Ubu – Anchieta – ES**

**Person in charge: Vanderley Esposito**

**Application: Blower for crushed coal transportation responsible for the dust collector.**

**Results: The instrument monitors the application since May 2008. In less than two months it indicated load variations and changes in motor power supply signals.**

**The pictures below show a thermographic analysis performed by the client that confirmed overheating in system power supply circuit components, such as breakers and contactors. The PA-01 indicated this failure.**



**The client confirmed product efficiency by issuing a SAT document with the following citation:**

**“I confirm that the SAT UM06/08: KRONPA PREDICTIVE ANALYZER (OM: 3600003564 and NT: 10084916) was concluded with the status: APPROVED.**

**This test aims to eliminate emergency stops due to motor burning, bearings, drawer defects, damper, imbalance, and misalignment.**

**The PA-01 operated in every equipment abnormality occurrence fulfilling what was expected. Using the PA-01 connected to a network, we will be able to monitor online the equipments in production line (where we have no smart protection) during predictive maintenance inspection intervals.**

**The predictive analyzer PA-01 was registered as stock item 343387 (stocked after ordering to the department) and it is available for installation in Ponta Ubu motors”.**



**Company: Tetra-Pak Ltda. – Monte Mor Unit**

**Address: Rodovia Campinas -Capivari , Km 23,5, Bairro do Chapéu do Sol – Monte Mor – SP**

**Person in charge: Arthur Uchoa**

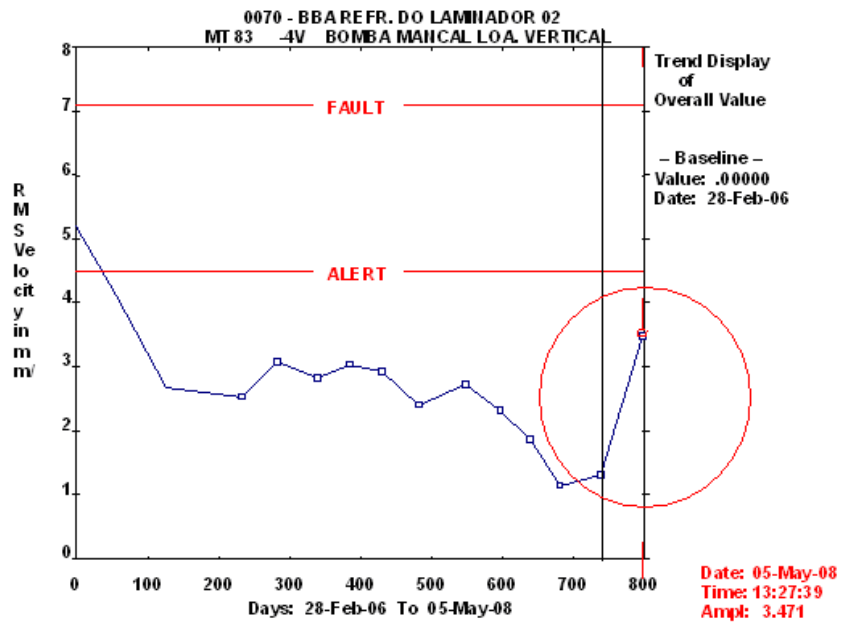
**Department: Maintenance**

**Application: Cylinder Cooling Pump**



**Results: The application monitoring started in March 2008. In less than two months, the PA-01 indicated initial failure process, besides load and power supply variations.**

**Then, the client issued a vibration analysis report. The picture below shows highlighted by a circle the period in which PA-01 monitored the application. Note that the monitored system condition worsened almost reaching the ALERT level.**



The line represents the period the PA-01 is monitoring the application.

**“On May 5<sup>th</sup>, the equipment was measured in normal measuring program”.  
“The equipment shows initial clearance and slight misalignment”.**

**As we see, the vibration analysis document confirmed the initial failure.**



**PAN-AMERICANA S.A.**  
INDÚSTRIAS QUÍMICAS

**Company: Pan-americana S.A. Chemical Industries**

**Address: End. Estrada João Paulo, nº 530 – Honório Gurgel – RJ**

**Person in charge: Fábio Lima**

**Department: Electrical Control and Development Group**

**Application: Soda pump for hypochlorite**

**Results: The application monitoring started in November 2008. For a month the PA-01 detected an ongoing failure process.**

**The client performed a vibration analysis and mechanical clearances were found in the pumps. An excerpt of the document issued is presented below:**

**“Vibration levels measured in the equipment presented significant range evolution. Spectral analysis showed high frequency range 1XRPM. This may be related to structural clearances and/or pump rotor defects.**

**Action: Verify the tightness of assembly fastening screws. Open and inspect pump components.**





**PAN-AMERICANA S.A.**  
INDÚSTRIAS QUÍMICAS

**Company: Pan-americana S.A. Chemical Industries**

**Address: End. Estrada João Paulo, nº 530 – Honório Gurgel – RJ**

**Person in charge: Fabio Lima**

**Department: Electrical Control and Development Group**

**Application: Hypochlorite exhauster**

**Results: The application monitoring started in November 2008. In less than a month the PA-01 indicated load variations and an ongoing failure process.**

**The client performed a maintenance procedure and the rotor was found damaged. Comments:**

**“The predictive analysis is not performed in the Hypochlorite Exhauster motor, but a problem was found in the rotor”.**



**Company: Saint-Gobain do Brasil Produtos Industriais e para Construção LTDA**  
**Address: Rua Rui Barbosa, 346 – Mauá – SP**

**People in charge: Viviane Chicano e César Dutra**  
**Department: Maintenance**

**Application: Glass cooling blower**



**Results: The PA-01 monitors this system since September 2008. In about a month, the PA-01 detected load variations and an ongoing failure condition. The load variations were due to a condition unnoticed in the stage the analyzer "learnt" about the application.**

**The client emphasized the PA-01 performance:**

**“What happened was that the damper was opened and closed. This gave favorable points to the PA-01 because it identified this system alteration.”**



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**People in charge: Viviane Chicano e César Dutra**  
**Department: Maintenance**

**Application: Workbench test – Motor driving a disk**



**Results: The client was interested in perform a workbench test with the PA-01. KRON personnel visited the company in order to provide guidance on test procedures. The test consisted of gradually placing weight on the disk driven by the motor.**

**Thus, as of November, the instrument underwent test conditions proposed. After monitoring for a month, it indicated variations in power supply signals, load variation, and ongoing damaging process.**

**The client emphasized again the PA-01 performance:**

**“The PA-01 on the test workbench showed a watch line and two watch load”.**  
**“I’ve just commented to César about the occurrence and I will disclose it to supervisors. César and I will arrange a meeting to discuss about determinant factors”.**



**Company: Arcelor Mittal Inox Brasil**  
**Address: Praça 1º de Maio, 9 – Centro – Timóteo – MG**

**Person in charge: Igor Mairinck**  
**Position: Electrician Engineer – Technical Assistant    Department: Maintenance Engineering**

**Person in Charge: Ari Vieira**

**Application: Gas exhauster responsible for regenerating hydrochloric acid**

**Results: The application monitoring started in May 2008. In less than a month, the PA-01 indicated evolution failure. The client performed a vibration analysis in the system and it diagnosed some disturbance as follows:**

**“Our vibration predictive maintenance analyst had already concurrently detected disturbances in the acceleration of this exhauster motor”.**

**“We may say that the PA-01 identified the beginning of the failure mode. This was verified with the predictive maintenance team and also in the field, along with the team”.**

**After the system maintenance intervention, the PA-01 had a successful confirmation:**

**“In a discussion with Ari, he explained that the exhauster underwent an intervention on June 18<sup>th</sup> when the "rotor" (blower pallet module) coupled to the motor shaft was replaced”.**

**“I emphasize that the PA-01 detected the anomaly in an initial stage”.**



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**Person in charge: Igor Mairinck**  
**Position: Electrician Engineer – Technical Assistant      Department: Maintenance Engineering**

**Person in Charge: Ari Vieira**

**Application: Gas exhauster responsible for regenerating hydrochloric acid**

**Results: After system intervention mentioned above, the monitoring of the new situation was started in July 2008. In less than a month the PA-01 detected a degrading process in components associated to the motor. Once again, the client performed a vibration analysis that indicated the need for replacing components as we see below:**

**“Yesterday (08/11/2008) an intervention was carried out in blower rotor bearing, that is, in motor load”.**

**“This problem had been diagnosed last week on Wednesday, and the intervention was planned for yesterday. The symptom was increased vibration and the blower rotor bearing was replaced”.**

**“It seems that the PA-01 has signaled this initial failure once again. We are gathering information on measures carried out and related reports”.**

**After information meeting, the client confirmed the success of the instrument:**

**“Our experience has showed that the PA-01 actually worked in both motor load events we witnessed here at the company”.**

**PA-01 efficiency led to a joint (KRON and Arcelor-Mittal) preparation of an article about maintenance management. The article “Three-phase motor failure detection using MCM Technology at Arcelor-Mittal Inox Brasil” will be submitted to the Technical Commission of the ABM 64º Annual Congress, which will be held on July 13-17 2009.**

**Company: Lwarcel Celulose e Papel Ltda.**

**Address: Rod. Juliano Lorenzetti, km 04, s/nº- – Lençóis Paulista – SP**

**Person in charge: Marcelo do Carmo**

**Position: Electrician Engineer**

**Department: Engineering and Maintenance  
Department**

**Application: Water pump for boiler supply (autonomous power generation)**



**Results: The application monitoring started in December 2007. In March 2008, the PA-01 indicated load and power supply variations, besides an ongoing failure process.**

**As a result, the company performed vibration and magnetic field analyses. Both techniques confirmed the damage. Lwarcel representative comments on magnetic field analysis is as follows:**

**“According to the company that performed the measurement, the motor shows initial rotor damage indicating broken bars. This is causing its eccentricity”.**



**Company: Usiminas Siderúrgica de Minas Gerais S.A.**

**Address: Avenida Pedro Linhares Gomes, 5431 – Ipatinga – MG**

**Person in charge: Gabriel Bampirra**

**Position: Electrician Engineer**

**Department: Ingot Casting Maintenance  
Management**

**Application: Steam exhauster**

**Results: The PA-01 started system monitoring in May 2008. In June 2008 it showed several indications related to load variation. The client evaluated company procedures for this application and reported that process interventions and unforeseen work conditions during instrument learning period were taking place.**

**He confirmed the analyzer efficiency by the statements below:**

**“What happened at the stop was in fact a cleaning, as you suggested. In the beginning of the week, the exhaust damper was opened”.**