



## Case Study

### Case Riohacha

#### Summary

Ballena complex, located on the outskirts of Riohacha, Colombia, has a team of contractors responsible for the maintenance and monitoring of the condition of its assets in what corresponds to its gas pumping units. This personnel makes reports on the condition of the compressors and combustion engines based on the interpretation of the data collected with their portable analyzer. The personnel of Proximotec / Holiztech evaluated the reports made by them and found inconsistencies in their diagnoses and prevented the stoppage of one of the pumping units suggested by such reports, which represented for the complex to avoid 19,700USD in expenses and loss of production.

#### Objectives

- Demonstrate the risks of relying on occasional analysis of the condition of the assets instead of continuous monitoring.

#### Unit condition analysis SK440 (Gas engine-compressor kit)

The SK440 unit is one of the assets present in Ballena complex for pumping gas. Its maintenance is carried out by personnel specialized in the maintenance and monitoring of this type of assets. Is this enough for good care of the machinery? Let's see.

The contractor sends comments on each one of the valves which are parts of the unit, i.e. compressor and motor. The following images show the comments about cylinder 1 and the compressor cylinder. On September 17, the flow balance was below the expected range in cylinder 1. In addition, valve HE3 in cylinder 3 was diagnosed with a strong valve opening discharge, however, 2 months later, the HE4 valve had the same diagnosis while HE3 was reported without any problem. No action was taken from September to November to repair the HE3 valve. In addition, the flow balance of cylinder 1 returns to normal in November. What happened then? It turns out that different analysts made the two reports studied in this text which led to this misinterpretation and lack of coherence of the data caused not only by human error at the moment of making the document but also because analyzing vibrations depends a lot on experience and opinion of each analyst. Is it really worthwhile to entrust the assets of a company to human interpretations?

Sub-component	Status	Diagnosis	Recommendation	Reference
Cylinder 1	AB	Flow balance values with slight deviation on HE 0.92 and CE 0.98 (limit values: 0.95 – 1.05), with is associated to minimum wear on discharge valves. There are no signs of abnormal behavior on vibration, ultrasonic nor temperature. <b>Status: Keep monitoring.</b>	Track flow balance values on HE.	Figures 5,6
Cylinder 2	AB	Flow balance values are normal on HE 0.98 and CE 0.96 (limit values: 0.95 – 1.05), which is associated with good discharge and suction valves conditions, <b>except for the strong opening on discharge valve HE3.</b> There is no signs of abnormal behavior in vibration, ultrasonic nor temperature. Status: <b>Keep monitoring</b>	Track temperature of discharge valve HE3.	Figures 5,6

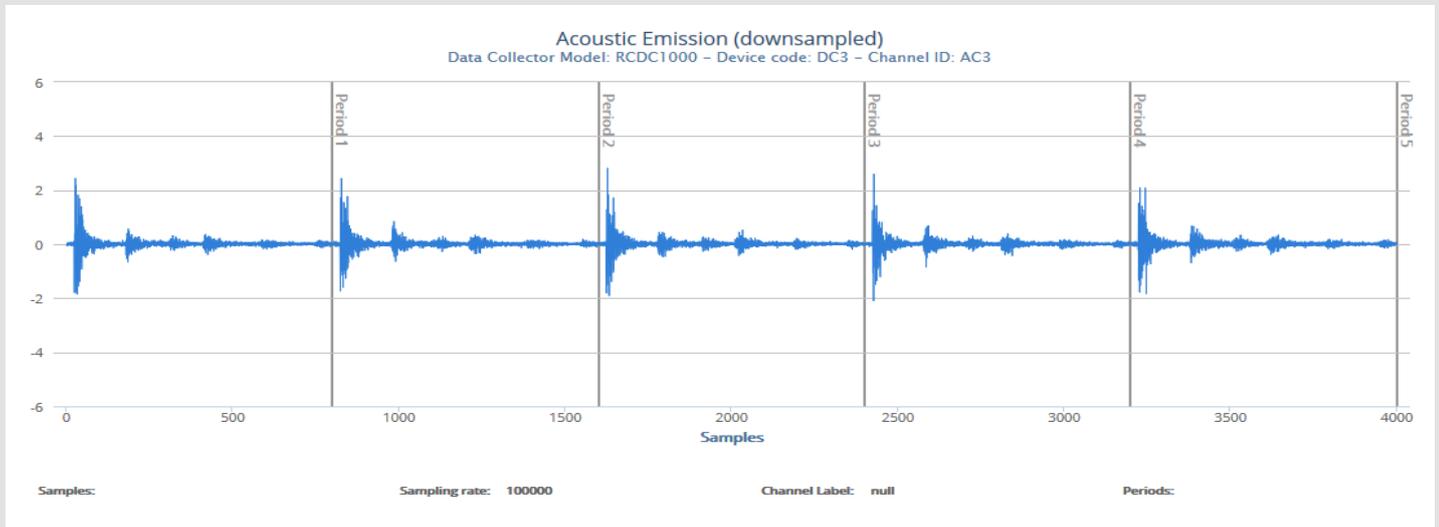
*Contractor's suggestions to the client about HE and HE3 on September 17, 2018.*

*Note: To see the original contractor's suggestions document; please contact Proximotec Representative.*

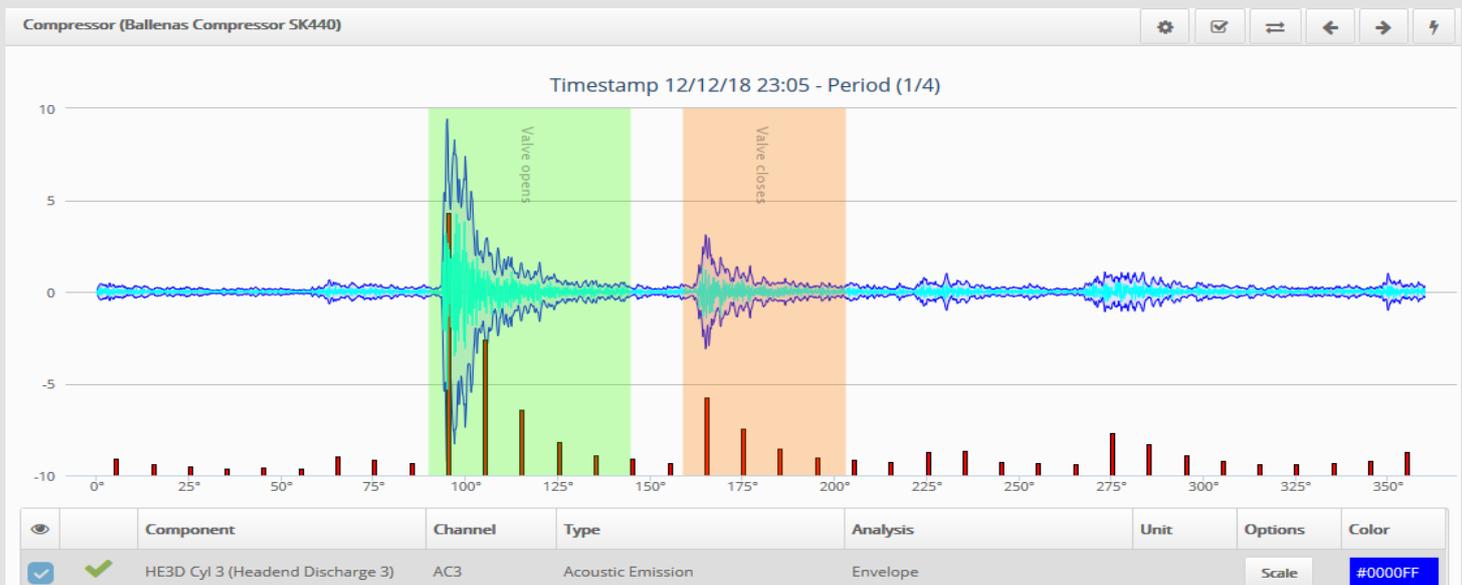
Sub-component	Status	Diagnosis	Recommendation	Reference
Cylinder 1	N	Normal flow balance values on HE 0.98 and CE 0.99 (limit values 0.95 – 1.05), which is associated with valves and rings in good condition. There is no signs of abnormal behavior in vibration, ultrasonic nor temperature. Status: <b>Acceptable</b>	Continue with vibration monitoring routines on established regular basis.	Figures 5,6
Cylinder 2	AB	Flow balances values are normal on HE 0.96 and CE 0.94 (limit values 0.95 – 1.05) which is associated with valves in good condition <b>except for strong opening on discharge valve HE4 with signs of failure.</b> Rings in good condition. There is no signs of abnormal behavior in vibration, ultrasonic nor temperature. Status: <b>Keep monitoring</b>	Track temperature of discharge valve HE4.	Figures 5,6

*Contractor's suggestions to the client about HE and HE4 on November 20, 2018*

For comparison purposes, Holiztech record of the HE3 valve is sent together to a report to show that no anomaly was detected in online monitoring unlike that reported by the contractors. The amplitude values in HE3 have remained stable and have not activated any of Holiztech alerts. In the lower part of the document the valves can be seen to be dismantled later during a scheduled maintenance for the 2000 hours of service. It can also be seen that they are in suitable conditions to continue operating and there are no signs of wear or damaged parts.



*Raw data taken from the HE3 valve of the compressor. No anomalies are found*



*Valve ultrasound analysis on HE3*



*Valve removed during scheduled maintenance*



*Visual inspection of the valve. Elements in good condition.*

## **Context of the situation**

The customer, seeking to increase the reliability of its assets, received external advice on the matter in which it was recommended to use continuous monitoring systems since the current maintenance schemes had not been sufficient to prevent damage to the reciprocating equipment and, in some cases, fatalities.

## **How was the work and who were involved?**

The operation was a joint effort between the customer field personnel, the contractors responsible for the maintenance of the gas pumping units and the personnel of Proximotec. The latter was in charge of carrying the hardware and the necessary elements for its installation. The customer staff was responsible for such installation while the contractors worked in conjunction with Proximotec to coordinate the supervision of the units as well as to define dates for meetings, delivery of reports and other elements to ensure effective monitoring of the assets.

## Results

Work Order WO7052775 was issued by the contractor based on their analysis. This consisted in the revision of the valves that had been indicated with problems and their replacements if necessary. The execution of this task required investing time and resources in removing the covers, dismantling the valves and carrying out the respective tests (sealing and checking wear) to validate the need of changing them. This entire process represents, between production losses and labor costs, around 19,700USD. All this money was saved thanks to the verification carried out by the Proximotec's engineers through the Holztech monitoring system installed in said gas pumping unit.

## Key points

Applied predictive maintenance, increased reliability of reciprocating equipment, valve monitoring, Internet of Things applied to the industry.

## Contact Details

<b>Name of Organization</b>	
<b>Contact Name</b>	
<b>Email Address</b>	
<b>Links</b>	<i>Please add links to any relevant pages/documents on your own website</i>