RCR
Tomlinson Ltd
INTEGRATED ENGINEERING SOLUTIONS

OFFSITE REPAIR CONTRACT

ILUKA RESOURCES LIMITED

FAILURE REPORT

Impeller & Shaft Only: Induced Draft Fan Runner SR2

DATE OF REPAIR: 29th of June 2006

JOB NO: J221320

PREPARED BY: VINCE SCATURRO
MANAGER RCR/ILUKA OSR CONTRACT (OSRI)

Distribution:

Brian Nichols (BN)
Geoff Upston (GU)
Jeff Smith (JS)
Joe Tufilli (JT)
Gerhard Slabber (GS)
Geoff Dawes (GD)
Kepler Demiellon (KD)
Joe Keane (JK)

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1 Summary:

In October 2005 a Fan impeller and shaft assembly from the SR02 plant was sent to RCR Bayswater (Vendor) for "balancing only". During the balancing process it was identified that there was excessive wear on the tips of the aerofoils. The vendor weld repaired the aerofoils, balanced the unit and sent it back to Iluka.

The unit remained in the Iluka store until May 2006 when it was fitted with bearings and subsequently installed into Functional location SR02-P22-201. The unit developed high vibration readings shortly after start-up which was considered to be caused by a faulty bearing.

The non drive end bearing was changed but high vibration continued therefore the Fan was removed and sent back to the vendor for warranty.

Investigation of the failure identified that the vendor procedure for identifying the scope of repair and the repair method chosen were inadequate.

Warranty to repair the fan impellor back to a serviceable condition is accepted based on the fact that vendor's systems failed.

The vendor has modified their Fan overhaul procedure to eliminate reoccurrence of this failure.

Name – Vince Scaturro
Title – Manager - OSRI

2 Background:

Whilst the following cannot be confirmed, due to the fact that Fan runners are not serialised and in some instances lack any form of identification, it considered based on a review of Iluka's SAP system and RCR's QARMS system to be a reflection of the events.

2.1 Sequence of Events:

Date	Event
15/09/2005	Impeller Shaft Assembly (ISA) only received at RCR Bayswater.
15/09/2005	Instructions on Iluka purchase order were to send to Veem Engineering for "balance only", therefore ISA was not inspected by RCR Bayswater.
03/10/2005	ISA despatched to Veem with instruction forwarded on to balance only.
03/10/2005	Veem advised RCR Tomlinson that ISA could not be balanced due to holes in leading blade leading edges.
04/10/2005	ISA was returned to RCR Bayswater.
06/10/2005	ISA was sent to Sandblasters and returned on 10/10/2005
12/10/2005	Alltest conducted an NDT and submitted report to RCR Bayswater Project Manager. (see MDR) No cracks were detected as a result of NDT test performed.
18/10/2005	RCR Bayswater prepared scope of work and quotation for repair which was sent to Iluka buyer for approval. RCR scope of repair was to weld in round bars to the leading edges of the impeller blades which were visibly eroded.
19/10/2005	Iluka send approval for RCR to proceed with repairs.
19/10/2005	RCR carry out weld repairs and despatch ISA to Veem Engineering for balance (Report 100111 attached G2.5)
21/10/2005	ISA received from Veem Engineering and prepared for painting.
24/10/2005	ISA painted undercoat red oxide only and shaft protected with clear rust preventative. ISA packaged and prepared for transport to site.
25/10/2005	ISA loaded onto Toll transport and despatched to site.
10/05/2006	ISA installed into functional location SR02-P22-201[1]
28/05/2006	Fan vibration reported at 8.8 & 13.7mm/sec
29/05/2006	A new non drive end bearing is fitted in an attempt to eliminate high vibration.
07/06/2006	Decision made to replace the fan (Fan1) with another fan (Fan 2) that had been repaired by RCR Bayswater using Imatec coating (Job 233901)
07/06/2006	Complete Fan1 assembly (inc bearing and coupling) was sent to RCR for warranty repair.
13/10/2006	Decision made to apply Imatec coating by K DeMillion (Iluka Principle Engineer)
15/10/2006	Imatec coating was applied by Imatec.
16/10/2006	Decision to use Imatec reversed by site RE G. Upston.
16/10/2006	Decision to cap leading edges of aerofoils based on thickness check of the material (G. Slabber in conjunction with G. Upston)
23/06/2006	Fan repaired by RCR and sent to site.

Table 1 – Sequence of Event:

[1] It is not clear at what point the bearings were fitted to the shaft

3 Failure Analysis (FA)

3.1 Key Findings:

- RCR's chosen repair method, to weld round bars to the leading edge of the blades, was based purely on a visual inspection (ie visibly holed).
- Whilst the repair method was considered to be suitable at the time it does not account for wear behind the blade tip which in this instance was shown to be significant.
- RCR's procedure did not require any thickness checking of the area behind the tip of the blade.
- Iluka's system does not enable full traceability of their equipment. Iluka do not complete the installation check sheets as required under the contract. Iluka do not complete the warranty claim forms as required under the contract

3.2 Most Probable Root Cause(s):

- RCR's repair procedure failed to identify the extent of damage (wear) on the blades.
- The repair method chosen was inadequate.

4 Conclusion

Notwithstanding the fact that OSRI cannot confirm that the sequence of events is a true representation of what occurred, due largely to the fact that both RCR and Iluka failed to follow their procedures, it would appear that RCR's initial repair method was inadequate therefore the fan failed prematurely due to ingress of foreign material into the aerofoils causing the out of balance of the unit.

RCR accepts warranty for the final repair (i.e. capping) to the fan blades, however, cannot accept warranty for the initial Imatec coating, the removal of the Imatec coating (as Instructed by Iluka) and the removal and fitting of the bearings (not part of the original scope).

5 Preventive Actions

Item No.	Actions	By Who	By When
1	Amend the procedure to include a 10% thickness check of all "aerofoil" type fan impellers.	GS/JT	29/06/06
2	Amend the procedure to ensure "capping" of all blades is carried out when wear is greater than 30%, as indicated by the thickness check	GS/JT	29/06/06
3	Iluka to ensure that the installation check sheet is completed for all OSR equipment	BN	TBA
4	Iluka to ensure that the warranty claim forms are submitted when equipment fails prematurely	BN	TBA