Case Study 2 - Hydrocyclone Efficiency

Background

One of Jorin's clients had been experiencing prolonged periods of high oil in water concentrations with their installed hydrocyclones. The reported efficiencies fluctuated greatly and it was suspected that the hydrocyclone was not performing in accordance with the manufacturer's specification.

Aim

The aim of this work was to increase the performance of the hydrocyclone by variation of the process parameters controlling the hydrocyclone operation i.e. flow rate, ΔP and K ratio. Using Jorin's ViPA technology, instantaneous performance data was obtained that allowed for the optimisation of the hydrocyclone in real-time.

Results

The site data was primarily collected using Jorin's mobile ViPA technology which is designed and constructed to operate in hazardous environments.

The performance of the hydrocyclones was assessed during a period where the process plant was being operated in steady state conditions. The graphical representation of the results for the oil concentrations and hydrocyclone efficiencies are shown in Figure 1.

The comparison of upstream and downstream concentrations and efficiencies showed a varying removal efficiency and initial average upstream oil concentration of 135 ppm to a downstream concentration of 100 ppm. The removal efficiency, during the period before optimisation was, observed to fluctuate between 0% and 43%.and averaged 26%. The concentration upstream appears relatively stable; the concentration downstream shows conversely, instability, indicating poor hydrocyclone performance.

The graphical representation of the results for the mean oil droplet size is shown in Figure 2. The mean oil droplet size upstream and downstream could be monitored and was shown to be stable upstream at an average size of 12 microns. However it was discovered to be unstable downstream thus again indicating poor hydrocyclone performance.

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Once an understanding of the hydrocyclone performance had been achieved adjustments were implemented to the K ratio; increasing the pressure drop within each liner and therefore increasing the separation efficiency. While the performance is still lower that would be expected a significant increase in removal efficiency was achieved. The average separation efficiency following the optimisation was 60%, a 34% improvement in efficiency achieved within a 4 hour period.

Conclusions

The ViPA system enabled a significant process efficiency increase to be made to existing process plant by optimising operating conditions. Recommendations as to the optimum K ratio were made to the client, based on the observations and data recorded. Further monitoring should be conducted to ensure that the performance is maintained.

These results clearly show the benefit of ViPA technology for the monitoring and management of a hydrocyclone system; providing necessary process data that can optimise and monitor performance in real time.

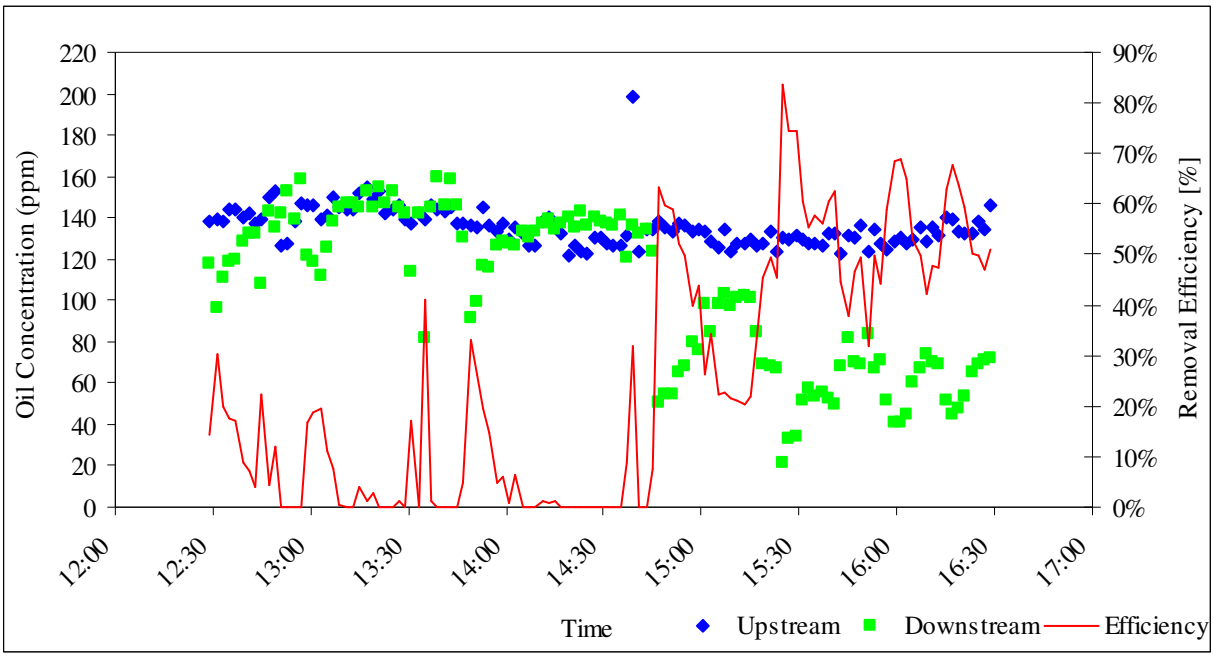

Figure 1: Oil concentrations upstream and downstream of the hydrocyclone along with calculated hydrocyclone efficiencies

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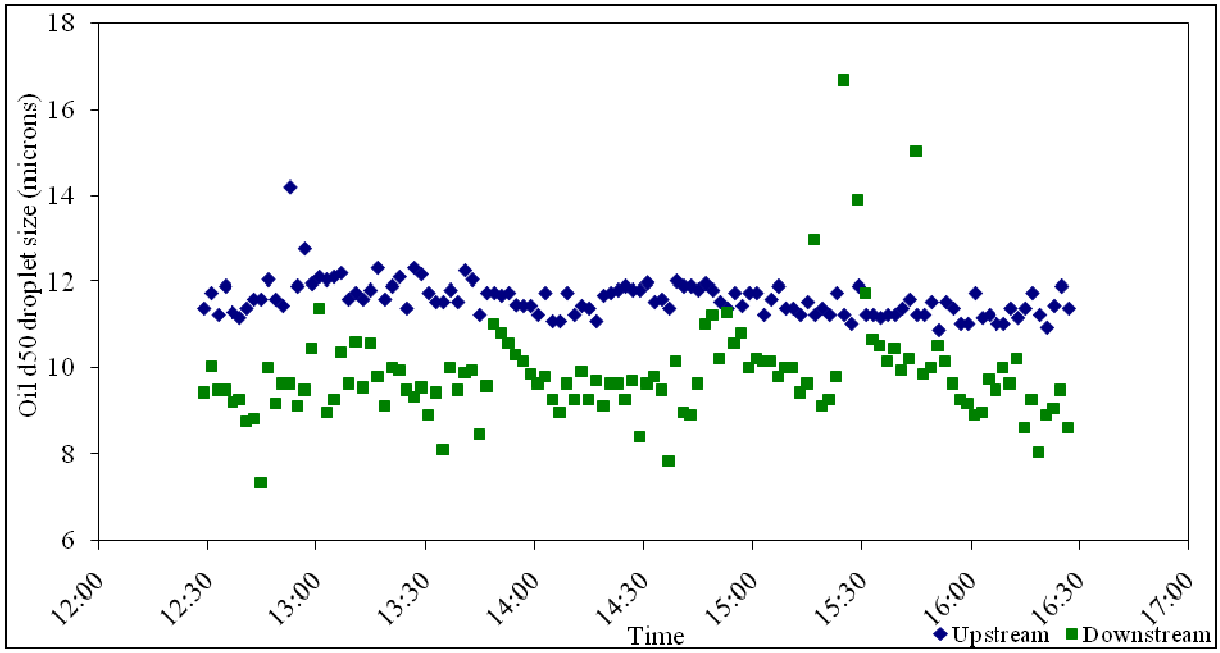

Figure 2: Mean oil droplet size distribution upstream and downstream of the hydrocyclone

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