

Severn Power Ltd.

**Disposal of Ammoniated Effluent from the
Severn Power CCGT Power Station**

Permit Number EPR/HP3737UE

Improvement Condition IC7

JANUARY 2015

1 Summary

In May 2011 a report was submitted to the Environment Agency, that outlined the possible ammoniated effluent treatment methods available in an attempt to find the most suitable in terms of environmental effectiveness and cost. The report also highlighted the problems associated with each of these possible solutions.

At the time of the report, the effluent from the Condensate Polishing Plant and the MAJ system, which is the extraction of non-condensable gasses drawn off from the Air Cooled Condenser, was analysed for ammonia content and was found to be too high for the direct discharge to the river and was being removed by road tanker to a suitable treatment plant off-site.

This is still the situation today.

At a meeting at Severn Power Station on 15th October 2012, a review of the progress to date was held and it was decided that in order to eventually arrive at the most effective solution, the resolution of IC7 would be treated as an on-going project, which Severn Power Limited would progress with all diligence and provide regular updates to the EAW, now NRW.

During October 2012 an update of the progress made in finding a permanent solution to the issue of ammoniated waste in terms of operational cost and environmental effectiveness, was issued, in line with the proposed schedule of updates.

In March 2013 an update was issued which described how the proposed De-Gassed Conductivity Analyser project was progressing, which at that stage had undergone in-house technical review and that a cost estimate for the supply and installation was being given financial consideration prior to the issue of a Purchase Order in order for the works to commence.

In June 2013 the progress on the project to install de-gassed conductivity analysers was reported as well as some other initiatives which were being explored in order to reduce production of the effluent or to re-use. There were also further developments with regards to the possibility of entering into some agreement with Welsh Water for the treatment of produced effluent at the treatment site local to the power station.

In September 2013 the De-gassed conductivity analysers had been fitted and the effect of this was being monitored to determine the resultant reduction in required tanker collections, as well as reduction in the requirement of process chemicals.

In January 2014 the measurable effects so far from the installation of the degassed conductivity analysers as well as an update on the progress of on-going discussions with Welsh Water. Also a description of a new initiative to explore the possibility of eliminating the requirement for condensate polishing and a general update on other related issues.

In April 2014 an update on the progress of on-going discussions with Welsh Water, along with a description of a new initiative to explore the possibility of eliminating the requirement for condensate polishing and a general update on other related issues was given.

In July 2014 update an update on the progress made with these initiatives was given.

It was envisaged at the time of the January 2014 update that by the time the April 2014 update was due, the station would have collected sufficient operational data to be able to quantify the effectiveness of the de-gassed conductivity analysers, a table showing the monthly tanker movements was given. Further information is being gathered and will be reviewed to determine if the foreseen benefits have actually been realised.

In October 2014 it was reported that most of the methods that had previously seemed so promising had by then been discounted for a number of reasons. Although some information was still to be received, it appeared that the most acceptable solution would be to deliver the collected waste by tanker to the local treatment works at Nash.

Discussions with Welsh Water had continued and certain activities had already been completed, which following the submission of a "Trade Effluent pack 12" and associated payment having been made, included the cleaning and preparation of the proposed holding tank, inspection of the tank and arrangements with a local waste transporter to collect the waste. Structurally the tank was found to be sound and trials were planned for January 2015 to determine the actual delivery regime in terms of flow rates. It was expected that the capacity would be more than sufficient for the expected volumes and concentration involved.

The planned water chemistry tests, which would determine whether the use of the Condensate Polishing Plant could be discontinued with the removal of this as a waste stream thus reducing the amount of produced ammoniated waste requiring transport off-site, have been completed. The instrumentation has been removed and the associated tests for constituent "carry-over" have been completed. The data from this monitoring has now been collected and the department conducting the study will compare the field data to the results calculated by using the computer modelling and the possible process improvements, in terms of reduced polishing plant operations, will be determined. As yet there have been no conclusions from this study communicated to Severn Power Limited.

Although all of the required information necessary in order to make the decision as to which would be the best long term solution is still not available, sufficient information has been gathered to discount a number of the initial potential solutions and it is becoming clear that continued use of road tankers to remove ammoniated waste water remains the best option although at present this cannot be arranged for delivery to the local treatment works. Further treatment to reduce MAJ waste production by reverse osmosis was deemed not to be practical and the implementation of an on-site treatment facility was also discounted.

There are new initiatives being explored involving Uskmouth Power Station and a re-assessment of the feasibility of laying a dedicated pipe to the local treatment works. Also regular reviews of available technologies will continue with the aim of adopting the most environmentally responsible approach.

Further emerging initiatives which have the potential to offer a more attractive solution or combination of solutions, both in terms of cost and environmentally acceptable will be reviewed as they become known.

It was hoped that by the end of January 2015 the trials at the Nash facility would have been completed and the required information would have been collected. It was at that time also suggested that Severn Power Limited, Siemens O&M and NRW meet up to discuss the adoption of this solution as the final long term strategy for dealing with this waste stream and the possible closing of IC7 as an improvement condition.

This January update summarises the development that have occurred since October 2014 and describes that actions that are now required in order that IC 7 can be closed.

2 On-going Initiatives to Remove, Reduce and Reuse

2.1 Remove

The use of ammonia in the process is unavoidable, so removal is not an option that can be progressed to any great effect.

2.2 Reduce

The current initiative for reducing ammonia waste production by the use of De-gassed Conductivity Analysers downstream of the condensate polishing plant, is in operation. This has been implemented on both streams and data is being collected. Data analysis is on-going.

Further trials were carried out by Siemens to validate a calculation based assessment of impurities (Na, SiO₂), iron concentrations and ammonia within the water steam cycle under various conditions to determine if HRSGs utilising Benson technology can operate within limits, without the use of a Condensate Polishing Plant. If the outcome of these trials is as expected then the use of the CPP can be discontinued and therefore this waste stream will be eliminated. The data provided by this monitoring has been collected and is being compared to the theoretical model. This forms part of an academic study and upon completion of the study, the possible operational improvements will be known and can then be implemented. As yet there is still no feedback.

2.3 Reuse

The project to install a reverse osmosis plant to remove the unwanted non-ammonia elements from the MAJ waste stream, which would enable re-use of the ammoniated water drawn off with the non-condensable gasses.

As there has been no further communication from Watercare it is assumed that this initiative is no longer viable and can no longer be expected to offer the benefits first envisaged. SPL will no longer actively chase this but will of course review any further information supplied by them should they decide to resurrect this project prior to the final solution being decided upon.

3 De gassed conductivity analyser

The de-gassed conductivity analysers on the CPP are in operation and a reduction in tanker movements for disposal of waste generated from this activity has been noticed.

4 Other Initiatives

4.1 The possibility of delivering waste ammoniated water to the local water treatment plant.

Following the site meetings and subsequent tank cleaning and inspections, it has been established that the tanks are substantially sound although some internal lining is required.

External superficial refurbishment may also be considered for long term use. Quotes have been received for tank lining and tank replacement and it was hoped that a further meeting with Welsh Water will establish a date for the completion of such works, at that stage trial flow rates could have been taken which would have determined waste delivery schedules. A trial of a number of local transport service providers would have also been undertaken.

If this disposal solution had been viable, this would have meant that the transport by road would be reduced with the environmental benefits this entails. It was also seen as the most cost effective and overall environmentally sound way of disposing of the produced ammoniated waste.

Update.

Despite the submission over a year ago of the Trade Effluent Pack 12, and the subsequent on-going work and expense, on 4th December 2014 we were informed by Welsh Water that they do not hold a license to accept waste in this way.

This effectively removed this as an option for disposal of the ammoniated waste and put the study programme back over 12 Months.

4.2 Reverse Osmosis Treatment of MAJ Non-Condensable Gasses.

This initiative is no longer being actively progressed.

4.3 Purchase of additional land in which to locate additional treatment on-site.

This initiative is no longer being actively progressed..

4.4 Extensive trials to validate a calculation based assessment of water impurities

This initiative is no longer being actively progressed.

5 On-going Programme

At present, from the data collected so far from the sampling it is looking as though removal by road tanker will remain the most cost effective and environmentally friendly method of dealing with the ammoniated waste streams at Severn Power. The amount of tanker collection is expected to be reduced significantly as a result of the de-gassed conductivity analysers on the condensate polishing plant. Also the raw chemical usage is expected to fall as well.

Further on-site treatment initiatives have so far not offered an acceptable alternative to removal of waste water by road tanker.

The progress made with Welsh water concerning delivery of waste water to the local treatment works has now faltered because they were unaware they did not have the required licenses. This would have reduced journey time, journey distance and the transportation of ammoniated waste through populated areas. This would have been the most effective, from an environmental and cost perspective, long term solution.

6 New initiatives

In order to progress IC7 to an acceptable conclusion the following possibilities are being explored.

- 1 Discussions with the new owners of Uskmouth Power Station are taking place to explore the possibility of disposing of the waste streams into their process.
- 2 A local company is being consulted in order to get indicative costs for the laying of a suitable pipeline to the Nash Treatment works
- 3 The present waste disposal contractor is being asked to gather and analyse regular samples, against which indicative actual volumes are being recorded for re-assessment of the actual volume and concentrations which would help to determine the most acceptable disposal methods
- 4 Discussions are taking place with local waste carriers to determine if a more local suitable arrangement can be found to reduce the length of the transport journey.

Update schedule;

31 st March 2013	Update on the progress of the de-gassed conductivity analyser improvement project.
30 th June 2013	Update on the collection and assessment of sample analysis. Land purchase developments and review of technological innovations not previously considered.
30 th September 2013	Review of status and statement of intent.
31 st January 2014	Review of implemented initiatives and a summary of further measures under review.

30 th April 2014	Review of on-going discussions with Welsh Water and progress with Water chemistry tests
31 st July 2014	Further progress on the proposal to deliver to the local water treatment plant is being made with dates for the cleaning and inspection of the collection tank set for mid-August.
31 st October 2014	Further progress with Welsh Water has been made and this includes the cleaning and surveying of their holding tank. There are further tests to determine acceptable flow rates to be completed. There have been discussions with local organisations for the transfer of waste between the power station and the treatment works. A number of quotes for this service have been received. Other initiatives have been discounted including the reverse osmosis of the MAJ waste. There has been no further information resulting from the Carry over tests which were hope would mean the requirement for condensate polishing was no longer necessary.
30 th January 2015	Delivery to the local treatment site at Nash by road tanker is now not available and further studies are required in order to determine the most appropriate strategy. New initiatives are being followed that will hopefully have been fully evaluated by the end of April 2015. At this time it is hoped the final most appropriate solution will have been determined.