INLET SCREENS FOR STWs / WwTWs

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AUTHOR : BARRY THOMPSON
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1.0 INTRODUCTION – THE IMPORTANCE OF EFFICIENT SCREENING

The purchase, operation and maintenance of inlet screens on Sewage Treatment Works (STWs) represent a significant investment for any water company.

Screens that do not function efficiently increase operating expenditure because:

- poor reliability increases screen maintenance costs
- solid material passing through, over or around inlet screens can damage or block downstream process equipment, increasing works maintenance costs
- screens which require excessive wash-water / drive power increase energy costs, and
- poor screen performance can reduce effluent quality, and increase risk of consent failure

Specifically, failure of screening equipment to adequately remove solids to the required level can result in:

- visible debris and blockages / fouling in down-stream processes
- visible and offensive debris in final effluent, and
- sanitary product debris on beaches and riverbanks.

Legislation, aesthetic requirements and the need for improved and automated operation has driven UK water industry trends towards the finer screening of wastewater. As a result, an increasing number of “finescreens” have been made available by numerous suppliers in order to meet this demand. Purchasers and specifiers now have a wide choice of options when considering new screening plant.

To assist in making this choice, the UK water industry, via its collaborative research initiative UKWIR, funded a major screen evaluation initiative. This involved the construction and subsequent operation of a National Screen Evaluation Facility (NSEF) at Chester le Street STW, Co Durham, within Northumbrian Water. A programme of testing of various Inlet Screens then commenced.

ThompsonRPM continue to test screens at the facility for various screen suppliers, and are now regarded as the leading third-party independent certifier in this subject. In addition, ThompsonRPM have also evaluated the performance of existing screens installed around the UK by adapting the Test Facility procedures for use with in-situ testing elsewhere.
2.0 THE NATIONAL SCREEN EVALUATION FACILITY

The NSEF was commissioned in March 1998 and to date over 40 different screens from various manufacturers in the UK, Europe and the USA have been subjected to evaluation. A schematic process flow diagram of the NSEF is shown below.

The Facility is used to ‘type-test’ screens using the incoming sewerage flow from the Chester-le-Street STW drainage area.

The aim of this ‘type-testing’ is to confirm that screens meet minimum standards of process effectiveness during service. The intention is not to issue a ‘pass or fail’ certificate for a particular screen but to provide a quantitative measure of process effectiveness known as the Screenings Capture Ratio (SCR) - a value derived by sampling screen discharges and downstream gross solids loading.

The ‘Average SCR’ value for any particular screen has been accepted world-wide as the comparator for process performance when considering new screens. For example, the value is recognised by the UK Water Industry Mechanical & Electrical Specifications (WIMES) Initiative, and features in WIMES 5.02 – “Coarse (1D) Screens for Sewage Treatment” and WIMES 5.03 – “Fine (2D) Screens for Sewage Treatment”.

Test results are reported immediately to the equipment supplier concerned and remain their property. TRPM do not disseminate results to any third party without the prior permission of the supplier. Suppliers are however offered the opportunity to have their results included in occasional comparative reports published via UKWIR – the most recent being UKWIR Report Ref No 11/WW/06/7 – “NSEF, Inlet Screen Evaluation, Comparative Report (1999 – 2011)

The screens included in the report are listed below. Supplier names have been updated, as far as possible, to reflect the current (January 2012) screen / supplier market position, and it should also be noted that some of the screens may no longer be available.
2.0 THE NATIONAL SCREEN EVALUATION FACILITY (CONT)

- Hydro Int Meva Rotoscreen
- Huber Rotamat Ro1
- Huber Rotamat Ro9 Microstrainer
- Ovivo Jones & Attwood Hi-Flow
- Ovivo Jones & Attwood Beltafine
- Ovivo Brackett Green CF Bandscreen
- Huber Stepscreen
- NOV Mono Inlet Screening System
- Andritz Aquascreen
- HBA Three Star Double Flow Bandscreen
- Andritz - Ruthner Aquascreen
- Huber Rotamat RPPS
- Spaans Babcock / Bormet MC
- Hollung Stepscreen
- WAM SPECO GE Screen
- Hydrok Noggerath NSI Spiralsieve
- Ovivo Brackett Green STS Finescreen
- CSO Technik FSM Filterscreen
- Huber Escamax
- Haigh ACE Bandscreen
- Ovivo EWT Spiral Screen
- M&N Combined Screen
- Longwood Escalator
- EPS Orca Brush Screen
- Haigh ACE Screener
- Longwood Elevator
- JWCi Auger Monster
- SKE Solutions Spiraline
- Intralox Hydrolux Screen (Various Series)
- Hydro-Dyne Hydro-Flo Screen
- HBA Three Star Travelling Finescreen

For screens with aperture sizes of 6 mm and 5 mm, average SCRs are generally found to be in the region of 80% for Bandscreens and between 70% and 80% for most 'standard' Finescreens. Finescreens with self-adjusting brushes appear to give SCR values closer to those achieved by Bandscreens. SCRs for Combined Screens can vary widely dependent on sub-generic type, with the most common (Spiral Screens) generally giving results in the region of 50%. SCRs for Slotscreens have also been found to vary widely but are lower than those given by Finescreens, whilst the SCR for the sole Stepscreen tested so far with this nominal aperture was also comparatively low.

For screens with aperture sizes of 3 mm, 2 mm and 1 mm, average SCRs are generally found to be in the region of 90% for Bandscreens but can be variable across the different aperture sizes / orientations used within Finescreens. SCRs for Combined Screens can again vary widely dependent on sub-generic type and aperture size / orientation. As before, SCRs for Slotscreens can also vary considerably, whilst the SCR for the two Stepscreens tested to date with this nominal aperture were similar to Combined Screens with say 5 mm or 6 mm apertures.
3.0 SCREEN SELECTION & DESIGN

As can be seen from above, a considerable number of different screen designs are currently available within the UK market. Purchasers and specifiers now have a wide choice of options when considering new screening plant.

Outputs from the NSEF have greatly increased the knowledge available to purchasers and specifiers when considering process performance as part of equipment selection. Whilst this is probably the most important selection criteria, other issues to be considered should include some or all of the following:

- Compliance with recognised Specifications and Standards
- Product Establishment in Market
- Other End-User Experiences
- Design Issues, including Capacity, Range, Headloss, etc
- Screen Curtain Aperture Size / Geometry
- Mechanical Reliability
- Structural Integrity
- Whole-Life Cost
- Capital Cost
- Operational Expense, including Power and / or Wash Water Requirements
- Maintenance Liability
- Operational Spares Availability
- Supplier Commitment to After-Sales Service

ThompsonRPM have produced client-specific Screen Selection Guides for a number of UK Water Companies covering Inlet Screens, and also CSO / Overflow and Sludge Screens. Guides have also been produced covering related topics such as Screenings Treatment Equipment and Grit Removal / Treatment Equipment.

These Guides take the form of product-review based reports, and include a scoping study of options available, a review of current and emerging technologies, selection guidance by means of comparison of generic solutions, identification of particular solutions within each recommended generic type, and technical details / supporting information covering each identified solution.

ThompsonRPM have also enhanced these Selection Guides by producing a range of Design Guides covering the above topics, again for a number of UK Water Companies. These Design Guides develop standard designs for the solutions identified in the Selection Guides, including standard drawings, dimensions matrixes, supporting technical information, general design considerations, etc, and are compiled to suit the particular requirements of each Client.

In addition to the above standard guides, ThompsonRPM can provide site-specific screen selection / design guidance at any stage of a particular project life cycle. This guidance can be in the form of option-eering reviews, feasibility studies, design reviews, and installation / commissioning advice, and can include new-build installations, retrofit installations and refurbishment projects.
4.0 SCREEN SPECIFICATION & PROCUREMENT

Screen Specification – The WIMES Initiative

The Water Industry Mechanical & Electrical Specification (WIMES) Initiative is funded by each UK Water Company and is steered by a group comprising representatives from each Company. The objective is to produce a series of standard specifications for use across the industry covering a range of mechanical and electrical equipment. To date, approximately 60 specifications have been published. The initiative is co-ordinated by The Pump Centre, part of ESR Technology (who are in turn part of Hyder Consulting) based in Warrington, Cheshire, and further details, including the facility to purchase WIMES documents on-line, can be found at http://store.esrtechnology.com/wimes.cfm.

ThompsonRPM are closely involved with the production and ongoing development of the following WIMES documents:

- WIMES 2.02 (Grit Removal / Treatment Equipment)
- WIMES 2.03 (Package Inlet Works)
- WIMES 5.01 (Raw Water Intake Screens)
- WIMES 5.02 (Coarse (1D) Screens for Sewage Treatment)
- WIMES 5.03 (Fine (2D) Screens for Sewage Treatment)
- WIMES 5.04 (CSO / Overflow Screens)
- WIMES 5.05 (Sludge Screens)
- WIMES 6.03 (Screenings Handling Equipment)

ThompsonRPM can facilitate Workshops covering awareness and implementation of various WIMES specifications and have produced Guidance Notes, working to a client’s standard format, intended to aid understanding and encourage use of the specifications. In addition to this, ThompsonRPM have compiled client-specific specifications using WIMES documents as a start-point for numerous UK Water Companies, including for use as part of Framework Agreement exercises – see below.

Screen Procurement – Framework Agreements

“Framework Agreements” have become a recognised procurement tool in the UK, with suppliers bidding to be framework suppliers for particular products, such as screens, over an agreed number of years. The general principle is that one large competitive tendering exercise is carried out at the start of an identified period of investment, with the successful tenderers being awarded Framework Agreements covering the supply of their products over that period.

Most UK Water Companies have several Framework Agreements in place with many suppliers, covering a range of their most required products. ThompsonRPM have worked with several UK Water Companies in conducting Framework Agreement exercises, for equipment such as Inlet Screens, Overflow / CSO Screens, Grit Removal / Treatment Equipment and Screenings Handling Equipment.

ThompsonRPM can offer technical assistance at all stages of the Framework Agreement Process, including OJ Advertisement placement, compilation and review of Pre-Qualification Questionnaires, compilation of Technical Specifications, technical reviews of received tenders, and recommendations regarding potentially acceptable FA partners. ThompsonRPM offer a genuine independent service and guarantee complete Client confidentiality.