

INLET SCREENS FOR STWs / WwTWs

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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 down-stream 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.

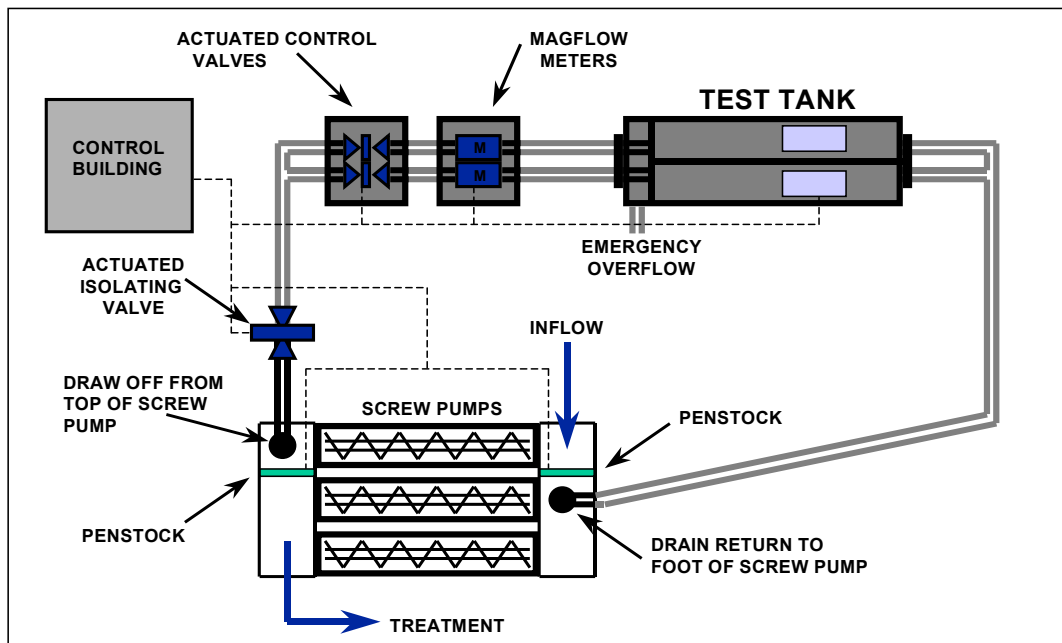
Legislation, aesthetic requirements and the need for improved and automated operation has driven UK water industry trends towards the finer screening of wastewater. As a result, an increasing number of “finescreens” have been made available by numerous suppliers in order to meet this demand. Purchasers 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 (NSEF)

The NSEF was commissioned in March 1998 and to date over 60 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 15/WW/06/10 - "NSEF, Inlet Screen Evaluation, Comparative Report (1999 - 2015)".

The screens included in this report are listed below. Supplier names have been updated, as far as possible, to reflect the current (January 2016) 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	5 mm bar spacings	Stepscreen
• Huber Rotamat Ro1	6 mm bar spacings	Combined Screen
• Huber Rotamat Ro9 Microstrainer	6 / 3 / 1 mm holes	Combined Screen
• Jacopa (ex Ovivo) J&A Hi-Flow	6 / 3 mm holes	Bandscreen
• Jacopa (ex Ovivo) J&A Beltafine	6 mm holes	Finescreen
• Jacopa (ex Ovivo) BG CF Bandscreen	6 / 3 mm holes	Bandscreen
• Huber Stepscreen	3 mm bar spacings	Stepscreen
• NOV Mono Inlet Screening System	5 mm holes	Combined Screen
• Andritz Aquascreen	6 mm holes	Finescreen
• Ham Baker TS DF Bandscreen	6 / 3 mm holes	Bandscreen
• Andritz - Ruthner Aquascreen	3 mm holes	Finescreen
• Huber Rotamat RPPS	6 mm holes	Combined Screen
• Spaans Babcock / Bormet MC	6 / 3 / 2 mm slots	Slotscreen
• Hollung Stepscreen	3 mm bar spacings	Stepscreen
• WAMGROUP SPECO GCE Screen	5 mm holes	Combined Screen
• BWT (was Hydrok) Noggerath Spiralsieve	6 mm holes	Combined Screen
• Jacopa (ex Ovivo) BG STS Finescreen	5 mm holes	Finescreen
• Haigh ACE Bandscreen	5 / 2 mm holes	Bandscreen
• Jacopa (ex Ovivo) EWT Spiral Screen	5 mm holes	Combined Screen
• M&N Combined Screen	6 mm holes	Combined Screen
• Longwood Escalator	6 mm holes	Finescreen
• EPS Orca Brush Screen	6 / 3 / 2 mm holes	Combined Screen
• Haigh ACE Screener	6 / 3 / 2 mm holes	Combined Screen
• Longwood Elevator	6 mm holes	Combined Screen
• JWCi Auger Monster	6 / 3 mm holes	Combined Screen
• SKE Solutions Spiraline	5 mm holes	Combined Screen
• Intralox Hydrolux Screen (Various Series)	(Various slots)	Slotscreen
• Hydro-Dyne (now via M&N) Hydro-Flo	6 / 2 mm holes	Bandscreen
• Ham Baker TS Travelling Finescreen	6 mm holes	Finescreen
• Andritz Aquadrum	2 / 1 mm holes	Drum Screen
• M&N (was CSO Technik) FSM Filterscreen	6 mm holes	Finescreen
• JASH Mahr MM2MM Screen	2 mm bar spacings	CC Raked Bar Screen
• Huber Escamax	6 mm holes	Finescreen
• JASH Mahr Perscalator	4 mm holes	Finescreen
• Andritz Aqualine	3 mm slots	Finescreen
• WAMGROUP SAVI Spiramatic VSA	6 / 2 / 1 mm holes	Combined Screen
• Ham Baker SP Screw Screen	6 mm holes	Combined Screen
• WAMGROUP SPECO FTR	6 mm holes	Combined Screen
• M&N FSM Bandscreen	6 mm holes	Bandscreen
• SBT ESM Screen	6 mm holes	Finescreen

2.0 THE NATIONAL SCREEN EVALUATION FACILITY (CONT)

The 2015 UKWIR Report indicated that for screens with aperture sizes of 6 mm, 5 mm and 4 mm the average SCRs for Bandscreens and most Finescreens were mainly found to be in the region of 80%. SCRs for Combined Screens varied considerably dependent on sub-generic type, with the most common (Spiral / Compaction Screens) generally giving results in the region of 50%. SCRs for "1D" screens (Slotscreens and Stepscreens) were also found to vary, but were (as could be expected), lower than those given by Finescreens.

The 2015 UKWIR Report also indicated that for screens with aperture sizes of 3 mm, 2 mm and 1 mm, average SCRs were generally found to be in the region of 90% for Bandscreens. The SCR for the only Finescreen tested within this aperture range was 84%. SCRs for Combined Screens were variable dependent on sub-generic type and aperture size / orientation. SCRs for "1D" screens again varied and were lower than those found for comparable Finescreens and Bandscreens. It can also be seen that, at low flows, Combined Screens can achieve SCR values above 90%, equal to Bandscreens, when smaller aperture sizes are used.

What is now apparent is that certain Finescreen designs can now offer SCR performance equal to, or often better than, the equivalent from Bandscreens previously tested. This obviously has far-reaching implications in terms of generic type screen selection.

Inlet Screen SCR Testing at the NSEF will continue as new and developed screens are introduced to the market.

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 physical selection criteria, other issues to be considered should include some or all of the following:

- Total Expenditure (Totex), also known as Whole-Life Cost
- Compliance with recognised Specifications and Standards
- Product Establishment in Market
- Other End-User Experiences
- Design Issues, including Capacity, Range, Headloss, etc
- Design Issues that promote safer Accessibility, Maintainability or Operability
- Screen Curtain Aperture Size / Geometry
- Mechanical Reliability
- Structural Integrity
- 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 Screens, Raw Water Intake screens and Sludge Screens. Guides have also been produced covering related topics such as Screenings Treatment Equipment, Grit Removal / Treatment Equipment, and Storm Tank Cleaning Equipment (see also other TRPM Technical Notes).

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 70 specifications have been published. The initiative is co-ordinated by The Pump Centre, based in Warrington, Cheshire.

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” are 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.