

SEWAGE SCREENINGS – TRANSFER AND TREATMENT

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1.0 INTRODUCTION – THE NEED FOR THE TREATMENT OF SEWAGE SCREENINGS

From 30 October 2007, non-hazardous waste (such as sewage screenings and grit) must be treated before it can be land-filled. This requirement, stemming from the EU Landfill Directive, is now applied in England and Wales by the Environmental Permitting (England and Wales) Regulations 2010. Scotland and Northern Ireland have equivalent waste strategies. In anticipation of this change in regulation, a report published in 2006 by United Kingdom Water Industry Research Ltd (UKWIR) included basic waste stream characterisation as required for landfill acceptance, and also an assessment of existing treatment processes to identify those that could meet pre-treatment requirements for landfill.

In parallel to this work, the UK Environment Agency published Guidance in February 2007, updated in November 2011, regarding the treatment of non-hazardous wastes for landfill. The document makes specific reference to sewage screenings (European Waste Code EWC 19 08 01). The Guidance introduces the concept of the 'Three Point Test', by which treatment options must be assessed to determine whether they meet the definition of treatment, thereby complying with the appropriate regulations. The 'Three Point Test' is detailed as follows:

1. It must be a physical, thermal, chemical or biological process (including sorting).
2. It must change the characteristics of the waste, and
3. It must do so in order to: Reduce its volume, or
Reduce its hazardous nature, or
Facilitate its handling, or
Enhance its recovery.

To confirm and clarify the regulatory / industry requirements specific to sewage screenings, a joint EA / Water UK Group was established in February 2007, the output being a 'Joint Position Statement' issued in October 2007. The statement acknowledged that from 30 October 2007, non-hazardous waste must be pre-treated before it can be land-filled, and advised that any waste in liquid form shall not be accepted at a landfill site.

The statement confirmed that '*there are no specific Waste Acceptance Criteria (WAC) limits for substances in non-hazardous waste*', and concluded that '*the sorting or de-watering of sewer grit and sewage screenings arising from crude sewage are acceptable forms of pre-treatment that meet the "Three Point Test".*'

Given that compaction of screenings inherently includes dewatering, then the use of correctly functioning and well maintained compaction equipment has since been taken as the minimum requirement in order to comply with the Regulations and fulfil the pre-treatment requirement.

Refer to ThompsonRPM Technical Note TRPM-TN005 – "The Treatment for Disposal of Sewage screenings and Grit" for discussion regarding the practical application of this guidance.

2.0 SCREENINGS HANDLING EQUIPMENT – DEFINITION / SPECIFICATION

In the UK, mechanical equipment used in the Water Industry is defined, specified and procured via a series of product-specific Water Industry Mechanical & Electrical Specifications (WIMES). The WIMES applicable to screenings treatment is WIMES 6.03 – ‘Screenings Handling Equipment’ - Issue 3, published Spring 2012.

This Specification sub-divides screenings handling into three sections as follows:

Screenings Transfer – the transfer of screenings to the screenings treatment equipment

Screenings Treatment – the treatment or conditioning the screenings for disposal

Screenings Disposal – the collection / removal of screenings for ultimate off-site disposal

WIMES 6.03 identifies and defines three generic types of **Screenings Transfer Equipment** as follows:

- *Screw Conveyors* normally incorporate shaftless spirals to ease the passage of gross solids and would include an inlet hopper, together with drainage deck options
- *Belt Conveyors* are not commonly used for screenings transfer due to issues retaining solids on the belt, particularly in outdoor environments, together with their inability to transfer the quantities of carrier water often present. Belt conveyors are covered within WIMES 6.03 by reference to “all relevant British and harmonised European and International Standards”.
- *Launder Troughs* are often fed by dedicated Launder Pumps and are simple u-shaped troughs that may incorporate additional features such as a stone trap (manual or automatic), a high level probe / alarm to detect blockages and / or a fail-safe emergency overflow.

It is also recognised that screenings can be transferred by certain types of solids handling pumps if sufficient carrier water is available, but these types of equipment are covered with the suite of Pump Specifications available via WIMES.

WIMES 6.03 identifies and defines three generic types of **Screenings Treatment Equipment**, as follows:

- *Screw Compactors* are basic units incorporating a single, one-directional screw, with only minimal washwater, which could be primarily intended for equipment cleansing (drainage deck clearance, etc) rather than screenings washing.
- *Washer Compactors* have additional features or facilities intended to provide a screenings washing function. These could include multi-spiral units, additional and / or higher pressure spray bars, a forward / reverse cyclic screw operation to provide agitation, an impellor to provide agitation in the feed hopper, a grinder to provide conditioning in the feed hopper, etc.
- *Tank Wash Systems* are an assembly of proprietary components where a holding / conditioning tank is both the first process stage and the most prominent individual item. Such systems can include screw (or washer) compactors as part of the overall equipment assembly.

WIMES 6.03 also includes examples of each type of equipment currently available within the UK market, although the list is not intended to be comprehensive, or to indicate preferred suppliers.

WIMES 6.03 does not cover **Screenings Disposal Equipment** as skips, bins, etc are seen as standardised proprietary items covered by manufacturers specifications.

3.0 SCREENINGS TRANSFER – LAUNDER v CONVEYOR

Not all screenings require transfer. It is often possible to locate treatment equipment directly under the feeding screen, thus removing the need for the transfer function. This arrangement does however restrict the treatment equipment selection to Screw Compactors (as Washer Compactors rely on the feeding launder water to help with the washing function). Where transfer is required, the physical selection decision (as opposed to commercial / Totex reasoning) is generally a straight forward choice between conveyor and launder. In making that decision, the following should be considered.

Type of feeding screen

Finescreens, most Combined Screens and any type of Coarse (1D) screen discharges a relatively dry product, therefore a conveyor (which would keep the product relatively dry) may be the preferred means of transfer. Conversely, Bandscreens and Drumscreens produce a wet product, discharged from internal launder troughs, thus using a transfer launder trough as an extension to the screen internal trough would be preferable for carrier water containment reasons.

Receiving treatment equipment

In general, Screw Compactors cannot handle excessive carrier water, thus should in most cases be conveyor-fed. If it has been determined, however, that a washing process is required from the treatment equipment for odour or other environmental reasons (ie a Washer Compactor is to be used) then a launder trough would be required as a large quantity of launder water would be required to assist that washing process.

Need to change direction/ elevation within the transfer equipment

Obviously, it is easier to change direction suddenly with a launder trough. Any change in direction with Screw Conveyors would require using more than one unit. Again, obviously, if elevation up to a pre-determined discharge height is required, then it is easier to achieve this with an inclined Screw Conveyor.

Need to feed multiple treatment units

Where more than one screenings treatment unit is to be employed on a 'duty / duty' basis, it is easier to split the screenings load within a bifurcated launder trough. However if the same units operate as 'duty / assist' or 'duty / standby', then it is easier to re-direct the entire screenings load to the current duty unit by means of actuated discharge points along the underside of a screw conveyor trough. Changing discharge direction within a Launder Trough system requires the use of specially-shaped gate valves / penstock blades.

Need to provide a Screenings Treatment Equipment bypass facility (eg for Maintenance)

A Screw Conveyor can be arranged such that all underside hatches are closed and the (relatively dry) screenings load is carried further into the receiving skip. To do this from a Launder Trough would soon result in a skip full of contaminated water.

Availability of a Water Supply

Screw Conveyors may require washwater, for example for drainage deck cleaning., but launder troughs (as they do not feature spray bars / nozzles) can operate with screened sewage, taken from directly downstream of the screen by a dedicated launder pump.

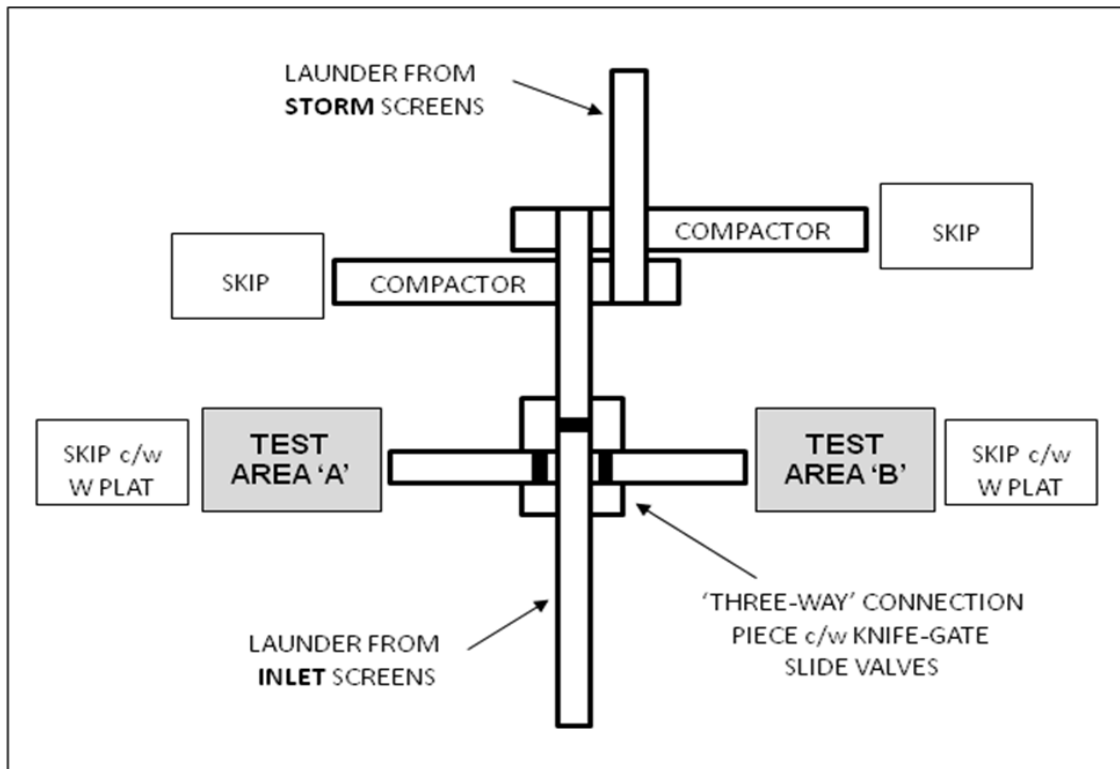
3.0 SCREENINGS TREATMENT – THE NATIONAL SCREENINGS TREATMENT FACILITY

Until comparatively recently, very little quantifiable knowledge existed within the UK Water Industry regarding the relative process performance merits of differing generic types of Screenings Treatment Equipment, or indeed, differing units within each generic type.

It was generally believed that Washer Compactors should provide a cleaner, but not necessarily dryer end product than Screw Compactors. Tank Wash Systems, despite often being regarded as high maintenance with a high energy requirement, were generally seen as producing the best quality end product because of the maceration / agitation functions within those units.

No real quantifiable attempt to support (or otherwise) those general assumptions was ever conducted, however, until late 2009, when the National Screenings Treatment Equipment Test Facility (NSTETF) was constructed at Netheridge STW, Gloucester (Severn Trent Water) in order to increase Water Industry knowledge.

The Facility was created by modifying the existing screenings handling process and equipment on site to create two ‘test areas’, each suitable for the temporary installation of screenings compacting, washing, and / or dewatering equipment for evaluation. Evaluation equipment included screenings sample stations, receiving skips c/w weighbridges and equipment power consumption meters. The schematic layout is shown below.



The Facility was commissioned in June 2010 with the installation of two units for an evaluation lasting approximately six months. Following this, further units were installed for similar periods, in an overall programme which was initially expected to be of three years duration but which has eventually extended to almost five years, with the potential for future testing.

3.0 THE NATIONAL SCREENINGS TREATMENT FACILITY (CONT)

A new single-number comparator was derived for use in comparing differing unit process performances – the Screenings Treatment Factor (STF). This is simply the average of three separate process indicators derived from taking screenings samples on site for submission to laboratory analysis, being:

- The Screenings % Volume Reduction
- The Screenings % Moisture Content Reduction, and
- The % Dry Solids in the Treated Screenings

It is likely that this comparator – the ‘Average STF’, will be used in future versions of WIMES 6.03 to allow purchasers / specifiers to set a minimum acceptance standard, in the way that the ‘Average SCR’ value for Inlet Screens (see ThompsonRPM Technical Note – TRPM-TN001) is used in WIMES 5.02 and WIMES 5.03.

As with screen testing at the NSEF, test results from the NSTETF 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. All suppliers of equipment tested up to the end of 2014 were however offered the opportunity to have their results included in the first comparative report, published via UKWIR in early 2015.

This report – UKWIR Report Ref 15/WW/06/8 – details the evaluation of 12 different STE Units evaluated over the initial programme duration. A further 4 units were also evaluated during that period, but the relevant suppliers / manufacturers have declined the opportunity to have their results included in this report. The units included in this report are listed below.

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| • Spirac Miniwasher | Washer Compactor |
| • Spirac Spiropress | Screw Compactor |
| • Huber WAP/L | Washer Compactor |
| • Huber WAP/SL | Washer Compactor |
| • M&N Kuhn Screw Press | Screw Compactor |
| • M&N Kuhn Wash Press | Washer Compactor |
| • Haigh ACE Package | Tank Wash System |
| • Longwood Combi-Wash | Washer Compactor |
| • Longwood Combi | Washer Compactor |
| • JWCi Screenings Washer Monster (with Grinder) | Washer Compactor |
| • JWCi Screenings Washer Monster (without Grinder) | Washer Compactor |
| • Ham Baker Adams Three Star Starwash | Washer Compactor |

(Post Evaluation Note – Spirac now market the ‘Miniwasher’ unit as the “Spirac Spirowash”)

Sub-division of the STF results found by equipment generic type reaffirmed the commonly held industry belief that the use of Washer Compactors is preferable to Screw Compactors, with five of the Washer Compactors tested giving a process performance of greater than or equal to the highest of the Screw Compactors tested. The sole Tank Wash System tested did not however, produce an end product superior in any respect to those found from other units.

4.0 SCREENINGS HANDLING EQUIPMENT (SHE) – SELECTION & DESIGN

As can be seen from above, a considerable number of different Screenings Handling Equipment (SHE) options 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 NSTETF have greatly increased the knowledge available to purchasers and specifiers when considering process performance as part of screenings treatment 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, etc
- Design Issues that promote safer Accessibility, Maintainability or Operability
- Mechanical Reliability
- Structural Integrity
- Maintenance Liability
- Operational Spares Availability
- Supplier Commitment to After-Sales Service

ThompsonRPM have produced client-specific Equipment Selection Guides for a number of UK Water Companies covering Screenings Handling Equipment, and also Inlet Screens, CSO Screens, Raw Water Intake screens and Sludge Screens. Guides have also been produced covering related topics such as 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 equipment 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.

5.0 SCREENINGS HANDLING EQUIPMENT (SHE) – SPECIFICATION & PROCUREMENT

SHE 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, part of ESR Technology 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.

SHE 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.