Bridger Scientific Inc.
114 State Road
Sagamore Beach, MA 02562
508-888-6699 Voice

PO Box 1923
Sandwich, MA 02563
508-888-5919 Fax

David J. Schlottenmier, Mechanical Engineer
schlott@cape.com

Standard Cooling Water Skid Construction and Features

Overview - This document describes a generic cooling water skid system to support the DATS 3 fouling monitor and other associated water quality instrumentation. Bridger designs and builds custom skids for customers in the continental USA. Local fabrication using this document as a general guide is appropriate for overseas customers where the expense of shipping a bulky integrated skid can be better invested by using local expertise and resources to build a suitable customized skid on site or in close proximity to the end user.

General System Description - The DATS fouling monitor requires support facilities at the plant site for reliable operation. This includes an adequate supply of cooling water, 120 or 240 VAC power and protection from the local environment (sun/wind/rain) as necessary. A PC type computer, communications cable or analog signal logging is also required, depending upon the type of DATS you select (2 or 3) and the method by which you intend to record and display data.

Typically the DATS fouling monitor is also used to set up a controlled environment (constant flow velocity and known fluid temperature) to expose other sensors to the cooling water media. This may include corrosion coupons, active (LPR, electrical resistance) corrosion measurement sensors (Rohrback Aquacorr, 9030…), pH, conductivity and TDS to name the more common instruments. The skid also normally includes provisions for taking grab samples for additional testing and calibration of the sensors.

Biocide, corrosion inhibitor, and dispersant injection and control systems may also be integrated into the skid for pilot scale testing of chemicals.

Environmental exposure and longevity of operation dictate the construction materials for the skid. We build skids with plastics, aluminum, galvanized steel or pressure treated lumber. Fasteners are normally galvanized steel or stainless steel. The skid base is a commercially available plastic pallet or a commercially available steel trailer bed or box on tires. The vertical structural elements are composed of extruded aluminum or galvanized steel with foamed plastic (PVC) panels for mounting equipment and instruments. Heavy equipment such as the circulation pump, is mounted directly to the skid base. The metal and plastic components are mounted with clamps and bolts which distribute mechanical forces over a large surface area. These skids and trailers are economic to ship around the continental US via surface freight or light towing companies.

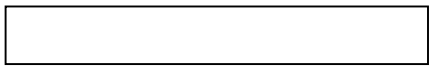
Other vendors use modified sea cargo containers (20, 28 or 40 ft x 8 x 8 ft) to provide a protected and secure environment for their instrumentation at power plants and petroleum refinery water treatment sites.. This method gives the advantages of reasonable price, as used containers are available at low cost around most of the industrial areas of the world. Additionally the infrastructure to move these steel boxes by truck, rail or around plants is frequently already in place. Finally they offer extreme protection from theft and vandalism due to their heavy steel construction. One disadvantage is difficulty in providing access points and penetrations for water, electricity, ambient light and human entrance, which typically requires the use of an acetylene torch.

The size, features and functions of a skid or trailer often extend beyond what is required by the DATS fouling monitor alone. We have built skids with modular cooling towers, supplemental heaters, water recirculation systems and various chemical injection systems. The materials, features and equipment are primarily influenced by the cooling water problems at the site(s) and the objectives of the water chemistry treatment plan.

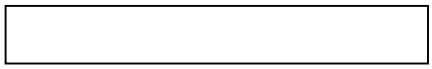
Bill of materials (typical):

DATS 3 fouling monitor with electronics, heat exchanger and flow controller
PVC plumbing, typically ¾ to 1.5 inch nominal pipe size
Valves, plastic, true union, ball type, for bypass, recirculation, drain, priming…
Pump, centrifugal, 25 gpm[100 liter/min], 30psi[200kPa], 120/240 VAC single phase, ~1 kVA
Strainer, plastic body, mesh size and physical dimensions as suitable for environment
Corrosion coupons, ½ inch x 3 inch standard size, with coupon holder and bushing
Corrosion monitor instrument, linear polarization method, with electrodes, analog outputs
pH sensor, with display and/or analog output
Conductivity (blow down) controller
Conductivity sensor, with display and/or analog output

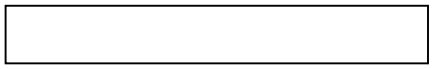
Plumbing diagram – Booster pump, strainer, calibration and discharge lines.



Electrical diagram – AC power junction box, fusing and disconnect, analog signal box.



Mechanical layout – Inverted T shaped frame with equipment on vertical face, pump on skid and sun shade overhead, clearance for tube cleaning, priming, coupon removal and site for portable PC.



Notes on Operation / Use

The skid system is ideally placed in close vicinity to the cooling water problem to be monitored and resolved. This affords the advantage of providing the system with cooling water at conditions as experienced within plant equipment experiencing the problem. Alternatively the skid is located at the plant intake or discharge and operated to monitor general fouling/scaling tendencies or with elevated heat flux and/or reduced flow velocity as an early warning of potential cooling water problems.

The tower blowdown is controlled by a commercial conductivity controller with an analog output. Supplemental thermal load may be supplied by electric heaters or via a heat exchanger from another heat source. Insure that the local heat flux on your supplemental source does not exceed the DATS set points or mineral scale will occur on the supplemental heaters first (an not on the DATS tube sensor surface). The thermal load on the tower should approach the tower design load or the cooling water loop will operate near the ambient wet bulb temperature and cooling water chemistry may not be indicative of that occurring on a full size (and thermally loaded) commercial/industrial cooling water system.

The signals from the DATS 3 fouling monitor (and other instrumentation if so equipped) must be recorded by customer supplied equipment. The DATS 3 to PC connection is only used to calibrate, configure and troubleshoot system operation (at present). The logging equipment may be generic or proprietary as provided by a chemical vendor, a DCS (distributed control system) if the plant is so equipped, or by a local PC based data acquisition system if the environment is suitable.

From the data logging system, the equipment operator will monitor system behavior by importing data into spreadsheet type programs (Excel, Lotus123, Star Office…) for graphical analysis and report preparation. From the accurate and appropriate analysis of this data, in combination with a thorough understanding of plant system operation, decisions can be made which will beneficially effect plant

economics by optimizing the treatment program for chemical cost, plant thermal efficiency (heat transfer), and environmental impact (compliance).