

Research Animal Facility Bedding Disposal

The Genentech South San Francisco Campus Achieves Cost Savings and Operating Efficiency by Applying the Right Waste Bedding Handling System



The Challenge of Effective Waste Bedding Management

Genentech's newest vivarium in South San Francisco (SSF) is a three story research building with the vivarium occupying the second and third floors. The cage wash facility is located centrally on the second floor. This large, rodent/rabbit vivarium is managed by Laboratory Animal Resources (LAR) management and maintained by dedicated facility engineers.

More than 150 bags of bedding are required to support the cage changing process performed weekly. When plans were in place to construct this new multi-story vivarium, LAR Senior Management knew they needed to find an automated alternative to their current process of manually transporting clean and dirty bags of bedding. LAR Senior Management created a team of stakeholders consisting of LAR Facility Supervisors and Facility Engineers to determine which bedding delivery system would be the best to meet the demands of their new multi-story vivarium. This also included the ability to handle multiple types of bedding and transporting dirty bedding with nesting material and paper shacks for disposal.

The team first created a list of equipment criteria, set goals for the final outcome, and then evaluated bedding delivery systems currently being used in the research industry. The pneumatic conveying system was evaluated first by the SSF team. This system uses air, either under pressure or vacuum, to move material through an enclosed tube. Due to the abrasive, sticky nature of dirty animal bedding, a dense phase vacuum system is typically recommended. Suzette Weber, Senior LAR Manager, along with the LAR Director visited several research facilities utilizing these pneumatic systems. Discussions with other animal facility personnel revealed these facilities had the same story to tell. While the vacuum pneumatics were said to be designed for animal bedding, in reality these systems

are inherently problematic when utilized in vivariums. All paper enrichment had to be hand-picked out of the cages before dumping. Even though these items were removed the pneumatic systems clogged frequently, especially on the dirty side. The downtime meant the maintenance team and others were exposed to the dirty bedding as repairs took place and the technicians had to revert to manually dumping the cages and removing the bagged waste when the system was down. The common factor for the continual clogging of the pneumatic systems among all references was material variability.

A Conveyor That Won't Clog

The nature of a dense phase vacuum system operates under positive or negative air pressure. The material movement occurs as the airflow travels over top the dense material that is at the bottom of the tube. This action creates "waves" of material, generating momentum, mass, and speed to move material down the tube.

When operating conditions are identical to design conditions, the principles of dense phase vacuum conveying will work. The reason these systems do not work well in vivarium applications is due to the number of variables in the waste bedding stream. Researchers may require different bedding types such as corn cob or Alpha-Dri®, each with different bulk densities. In addition, Genentech has a dedicated animal enrichment program that uses Nylabone®, plastic housing tubes, shepherd shacks and other paper enrichment items. Often these items are entrenched in the bedding when the cages are emptied in the waste bedding system. Occasionally, metal cage card holders and rubber gloves can also get trapped in the bedding and are accidentally dumped into the waste stream. All of these variables create operating challenges for vacuum systems because the pneumatics are designed to handle a specific type of material at a specific bulk density. Lighter materials can cause premature tube wear because these particles travel at a greater velocity than designed, larger items either move very slowly or become stationary, allowing the other material flowing round it to become trapped. Eventually the system clogs and stops working. At this point the conveyor must be taken apart, cleaned and started again. This often happens several

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times a week. This cycle will repeat and the system will be a continual maintenance challenge because of the design-operating differential.

The SSF team knew there had to be a better way to automate their bedding handling system. The team began to research other conveying options and found the Tubular Drag Conveyor by Hapman – a bedding handling system that was engineered by material handling experts for vivarium applications. Suzette, along with LAR's chief facility engineer, visited several site locations in Vancouver, WA to see this tubular drag conveyor system in operation. The sites selected utilized the tubular drag system in both vivarium and non-vivarium operations. One of the non-vivarium sites they visited operated their tubular drag system 24 hours a day for 364 days a year, moving hot, wet coffee beans. This particular system has been in operation for over 12 years.

After reviewing all the data compiled on the pneumatic conveying system and the tubular drag conveyor, the SSF team unanimously chose the tubular drag for its overall efficiency and cost savings. The Tubular Drag Conveyor offers a low-horsepower motor with minimal energy consumption. Hapman also has proven reliable operation in vivarium applications. These factors, in addition to its capability to handle multiple types of bedding and enrichment, met our evaluation criteria. "The system has performed as promised," stated Senior LAR Manager, Suzette Weber.

The dirty bedding removal system starts with a cage dump station located directly in front of the tunnel washer. This location provides minimal twisting and bending by cage wash personnel as they dump the dirty cages and put them directly into the washer. The dump station was designed to be a little over 10 feet in length; five feet longer than traditional dump stations. The added length on the station allows several personnel to dump cages at the same time. From the dump station, the soiled bedding is dropped through a stand pipe where the dirty bedding is conveyed by the Tubular Drag Conveyor to an outside, enclosed dumpster.

What makes this system significant from the vacuum system is the type of conveyor used in the Hapman bedding handling system. The Tubular Drag Conveyor uses a chain and flight assembly to move the material. This system operates under torque and speed ratios that provide for a low horse-power motor. The flights move the material through the tube and have the ability to handle

material variability and abrasion without clogging and breaking down. The Tubular Drag Conveyor moves material easily through different floor levels, around bends and runs above ceiling tiles down long corridors. This conveyor system is quiet to operate and requires little maintenance. In addition, the Tubular Drag Conveyor has the ability to handle any type of bedding, including enrichment and other items entrenched in the bedding without clogging and shutting down.

Retrofitting a Clean Bedding System

The initial purchase of the Hapman waste and clean bedding system was installed in the SSF facility in 2008. "The Tubular Drag conveyor with the chain and flight operation has worked as promised," states Mike Lane, SSF Chief Facility Engineer. "We experience excellent operational efficiency due to the near 100% up-time of the system."

The installation and operational success of the existing Hapman conveying system made the decision easy for LAR management when they decided to retrofit automation to their clean side of the cage wash in their existing vivarium. This retrofit would match the level of automation utilized in the clean side of the cage wash in LAR's multi-storied vivarium. The upgraded automation would include a clean bedding delivery and dispensing system. Once again the SSF LAR team reached out to the material handling professionals at Hapman for their assistance.

As with their multi-level vivarium, cage wash staff had to manually move 150+ bags of bedding weekly from LAR's loading dock to the clean storage room. The cage wash staff also hand filled thousands of rodent cages each week. Hapman engineers worked with the SSF team to automate the clean bedding delivery and filling process, and collaborated with the team to ensure the new Hapman system would marry seamlessly with both the existing cage wash equipment and the new bedding dispensing system.

Duplicating the Hapman delivering system in their multi-level vivarium, this retrofitted clean bedding hauling system begins with a bulk bag unloader. This bulk bag unloader was located in the clean bedding room and came equipped with a hoist and trolley assembly. The mechanism gave the cage wash staff the ability to hook the bag to the trolley assembly and use a hand control to automatically raise the bag over the unload point.

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A pinch valve allows the large bulk bag to be untied without dumping all the material at once, eliminating dust and potential material loss. Use of the pinch valve also allows the bedding from the bag to empty in a metered fashion. The bedding moves directly from the discharge hopper under the bulk bag unloader into the Tubular Drag Conveyor. The conveyor carries the clean bedding through the enclosed pipe where it feeds the bedding dispensing unit.

“SSF had an extremely successful installation and start-up of the Hapman system in our existing vivarium. Retrofitting the Hapman clean bedding delivery system in our older vivarium not only increased our work flow efficiency it has significantly reduced our ergonomic risks related to manually lifting bags of bedding and hand filling thousands of cages,” states Senior LAR Manager, Suzette Weber.

A Model for Successful Management

Senior LAR management was committed to improving their clean bedding delivery and dirty bedding removal at Genentech’s South San Francisco vivariums. When the evaluation of bedding handling systems began, senior management had several key goals to achieve:

- Consume minimal energy to operate
- Have the ability to handle all types of bedding and paper enrichment
- Operational reliability – a system easy for facility staff to maintain
- Requires the least amount of space to install with quiet operations

The SSF team found the material handling experts they needed in Hapman. Hapman worked with management and facilities engineering to fully understand the operating conditions of their vivariums, the logistical challenges of the various floors, and the importance to LAR’s senior management and team to achieve established goals. Suzette summarized the outcome of the projects by stating, “Both the waste and clean bedding systems bring continual value to Genentech. Our Company is a leader in innovation and automation that not only makes economic sense but also offers environmentally sustainable operating practices. The internal teamwork and vendor partnership delivered three bedding handling systems that met our results-driven goals. These systems are proof that we believe in providing the highest quality product by fostering the best in innovation and cost savings.”

ABOUT HAPMAN

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