Electrics vs. Hydraulics or Pneumatics

SecureUSA, Inc.

Electric motion control for activating vehicle barriers provides lower costs, easier maintenance, improved energy efficiency, cleaner working environments, better safety and more precise control than traditional pneumatic and hydraulic systems.

Security Supervisors would do themselves a favor by avoiding pneumatics and hydraulics because of all the troubles associated with them, like noise, maintenance issues and lubrication leaking. Barrier Manufacturers can make barriers work cheaper with pneumatics, but they're not as reliable and they're more objectionable to have in a security application. Hydraulics offer the ability to move very heavy metal barriers in a short amount of time, however are very vulnerable to leaks, high installation costs, and soaring maintenance costs.

The move to switch to electric barriers over hydraulic or pneumatic include the barriers' cost of ownership and maintainability, safety, and maintaining data for legal reasons if someone were to get hurt to show that the barrier did what it was supposed to do.

Pneumatic and hydraulic barriers require an endless expense to maintain filters, line air or fluid quality, and seals that have to be checked regularly. Combined with labor hours and barrier downtime, that adds up to high maintenance costs, inconvenience of traffic flow, and compromised security. Over the lifetime of a barrier, an electric solution can offer a lower cost because there aren't as many components that need to be maintained on a regular basis.

Installing the system

Electric servo systems have long been used in applications such as robotics, printing, and cutting systems. They now are being used in applications such as surface mounted wedge barriers, retractable bollards, flush mounted wedge barriers, security gates and crash cable beams.

The cost of an electric servo motor system is still higher than that of an equivalent pneumatic or conventional hydraulic solution. But as with all new technologies, the component costs will gradually drop over time, so it will subsequently replace pneumatic and hydraulic barrier systems.

When the installation is factored into the equation the electric barriers are usually lower than the older hydraulic and pneumatic systems because there is no additional construction needed for external power units. This saves the expense of excavation of additional hydraulic or pneumatic lines, forms, concrete pads necessary for the power units, all the labor necessary to terminate the controls, and test the system for leaks.

Electric technology

Most barrier manufacturers have relied on pneumatic or hydraulic actuation for the barriers this combined with electric power and low voltage control results in a need for maintenance competencies in all three disciplines. A facility manager will seek to simplify maintenance and reduce costs by consolidating to fewer technologies. Since electrical systems will inevitably be present in any facility, the focus tends to be on expanding their use and eliminating pneumatic and hydraulic technologies.

Electric barriers are becoming an alternative of choice because hydraulics are more prone to leaks and require managing fluids and filtration, along with space and enclosures for hydraulic reservoirs and pumps.

One military base that made the switch was experiencing problems with its hydraulically actuated wedge barrier systems at their main entrance. The system exhibited poor performance, problems associated with leaking hydraulic fluid (environmental, clean-up and associated safety issues), and resulting in security breach, down time, interrupted vehicle inspection procedures, and costly repair issues.

Speed and noise

One major challenge with moving a vehicle barrier is the weight of the plate or bollard that will receive the impact. The industry requires a normal operating speed of 3 to 5 seconds from fully down to the fully deployed position and 1 to 2 seconds for an emergency deployment. In the past this was only accomplished by hydraulics or pneumatics. The barriers using these technologies typically rely on some type of resistance to stop the barrier. A loud bang is heard as the plate comes to a full stop on the ground or the buttress if the barrier is deployed in the attack position.

The choice of the electric servo was based mainly on maintenance but the early units were too slow and experiments were sometimes abandoned because of 10 to 30 second operation. The servo units have made major advances in speed and are now able to operate well within the acceptable range. The barrier system needed to be very fast, and needed to be able to control the acceleration and deceleration to make the motion as smooth as possible. The electric servo combined with other drives provided speed and control. The engineers have also added a limit switch to ramp the speed up and down, this has allowed the plates to come to a soft rest which eliminates the loud bang normally associated with barriers as well as extending the life of the parts involved. Thusly this has eliminated a large quantity of high-maintenance wear items that were costly and time-consuming to replace. Significantly reducing machine maintenance and eliminating hydraulic fluid additions along with leaked fluid clean-up and disposal costs will lead to a twelve-month payback.

Easy installation

An electric barrier solution is so much easier to install than a hydraulic or pneumatic barrier solution. The barriers have self contained actuators that are driven from a PLC that is custom programmed for the facility. The power unit can be easily installed in an adjacent guard house or any secured position. There are no noisy pumps to distract security personnel. This easy installation simplifies the normal confusing and complicated conduit runs that are associated with older systems. Factory trained installers can simply follow a design drawing provided with the barrier plans together with a custom PLC package, and get almost an uneventful installation which will result in the roadway being open in 2 to 4 days rather than a typical 3 week project.

A sore spot

Many facilities are plagued with barriers that have been a source of trouble from the first day. Pre September 11, 2001 the only type of facilities that had barrier equipment in place were military, government, or nuclear sites. These barriers were installed by one or two of contractors and integrators that had some type of experience or history with these intimidating systems.

Post September 11, 2001 saw a flood of money that was thrown into the industry over a 4 year period that resulted in barrier manufacturers becoming overwhelmed with business, architects and engineers using “best guess” equipment in their designs, and contractors bidding and winning contracts to install security equipment they had never even seen before. Many facilities now have to create additional budgets and personnel to keep their barriers running even though they may have received a grant to get the additional security in place.

The equipment that was meant to protect the facility has now become a costly sore spot that constantly interrupts normal business, normal traffic flow, causes unrest among employees, and drains funds because of repair and maintenance issues. Consequently, there are many installations that now have malfunctioning systems and instead of the equipment being used as it was intended to prevent vehicular intrusion, it remains in the “down” position and not used.

Repair or replace

When deciding whether to repair or replace existing hydraulic or pneumatic barrier systems, facility managers must consider the equipment's technical requirements, maintenance costs, downtime, convenience, and security procedure breach. The benefits of electric barriers must be compared.

For example, a hydraulic barrier, which was installed correctly by a trained seasoned integrator rather than a general contractor with no experience, may only require minimal annual expense. In this case it would make more sense to get as much life from their initial investment, by contracting a qualified service and maintenance team.

Most facilities experience high repair and maintenance costs because of leaks associated with faulty installation. Paying to have a chaffed or leaky hose pulled and replaced is usually only a bandage if the conduit installation was incorrect. It is critical that the conduit routes, the angle and size of the conduits, the stress points, the couplings, and even the material used must be reviewed and approved or the hydraulic hose will chaff and develop a hazardous leak within 6 months of operation. The removal of a continuous leaky hydraulic system and replaced with an electric barrier system will immediately eliminate the leaks, which unchecked could involve the EPA, and restore a reliable security to prevent unwanted vehicle intrusion. The ROI will be quick depending on the continuous repair and maintenance costs.

Designed right from the beginning

As previously mentioned, in the past few years well meaning architects and engineers were employed by owners, facility managers, and corporations to "beef up" or "harden" the perimeter of a building or facility. Without the proper experience or correct consulting there is no way to determine the correct barrier to prevent unwanted vehicle intrusion without experience.

On the market today there are close to 20 different types of wedge barrier systems, 10 different types of retractable bollard systems, 6 different types of cable beam systems, 5 different types of security gates not to mention the different types of static barriers such as bollards, planters, and fencing. Previously there were only 4 major manufacturers of barrier equipment on the Department of State list, there are now over 27. How could any architect, engineer or security consultant become familiar enough to recommend the correct barrier without intimate knowledge of how the barrier performs, how it is installed, how it is controlled, what safety features are needed, and how it will be maintained to accomplish security policy?

Team approach for security

Sometimes it makes sense to separate security from construction. Why would a facility go to the trouble and expense to design a security plan that involves the type of equipment, conduit runs that control the equipment and security procedures that must be kept confidential only to be put their plan back on the open market in the form of a bid? These plans are easily obtained by anyone and can contain information used to defeat the very system that was supposed to protect the building.

A better solution would be using a turnkey specialist that can help with the plan from the beginning. This saves time and money by not having to guess or spend time scanning the market educating oneself on the many barrier options available. The turnkey security specialist can control the bid process with select contractors doing the civil work and only provide plans that will not compromise security.

In order to properly harden the perimeter of a new or existing building, many factors must be measured, considered, and discussed prior to barrier equipment selection. Many papers have been written on the complexity of designing perimeter security. Crucial items include amount of protection needed to accomplish absolute security or perception of security for vehicle or pedestrian intrusion. Volume of traffic anticipated, depth of excavation, underground utilities, power requirements, sequence of operation, safety devices, and operation procedures are just a few items that must be discussed prior to any equipment selection. These discussions must include the engineers, facility managers, security directors, owners and end users.

SecureUSA Inc.®
Perimeter Defense Solutions

Decision check points

- ☐ **Level of Security.** What is the end user trying to accomplish?
- ☐ **Sequence of Operation.** How will the barrier be used? What type of traffic is expected?
- ☐ **Ease of installation.** How easy it to install the equipment? What is the down time of the entrance?
- ☐ **Initial system cost and simplicity of installation.** Electric barrier systems tend to be more costly than older technologies, but are quickly recaptured in installation.
- ☐ **Long- and short-term funds to maintain the barrier.** Facility managers are finding it difficult and costly to keep hydraulic and pneumatic units running.
- ☐ **Maintenance and parts availability.**
- ☐ **Reliability.**
- ☐ **Security features.** Safety loops, traffic lights, infrared sensors, remote and barrier controls must be considered.
- ☐ **Cleanliness.** Electrical systems typically cleaner instead of hydraulics or pneumatic.
- ☐ **Safety.** Hydraulics typically are avoided in hazardous environments.
- ☐ **Speed.** Electric barriers meet the speed required for security
- ☐ **Barrier placement and control points.**
- ☐ **Aesthetics and space restrictions.**

Conclusion

A properly designed security system with electric actuated barriers will be less expensive to install and maintain. Any initial cost difference will be balanced within the first year of operation.