

Thermal Security Cameras Protect the Home Turf

A BYU Case Study...



Affordable, high-performance thermal security cameras have revolutionized the video security industry. Their flexibility, performance, and low total cost of ownership have made them viable security imaging solutions for a broader range of applications than ever imagined.

Case in point: Brigham Young University is now using thermal security cameras to look after their newly renovated football field.

The 28 year-old sod was removed, a new drainage system installed, and new grass laid down in early 2009. The renovation took approximately five months to complete and cost over \$1 million, so University administrators and campus police turned to thermal security cameras to safeguard this significant investment in their state-of-the-art facility.

Securing The Home Field

Visible light cameras were quickly shown to be an imperfect solution. With roughly half of every day happening after the sun drops below the horizon, this leaves large facilities under secured for large portions of the day. Conventional CCTV cameras – even ones purporting to be “lowlight” – need an outside source of illumination if they’re going to create an image after dark.

This exposes one of their primary tactical limitations, namely that they can’t generate images of intruders beyond the range of their illumination source. This typically limits their effectiveness to a few hundred feet, when the environment may require surveillance capability that stretches for miles.

The threats to the field at BYU’s LaVell Edwards Stadium range from thrill-seeking trespassers jumping the fence to get on the field after hours, to low frequency, high-impact vandalism perpetrated by rival fans or other ill-intended trespassers.

Naturally, the answer to the field’s security wasn’t as simple as just locking down the stadium. BYU has been looking for a viable detection method for several years. The job of keeping trespassers off the field was complicated by the stadium being open to the public during daylight hours for people who want to run the stadium’s stairs, and the need to secure the facility’s perimeter, but keep the field itself accessible to maintenance crews and grounds keepers.

The task of securing the field fell to BYU’s campus police. As part of their process for determining the best security technology to use, they temporarily installed a thermal security camera from FLIR Systems on a tripod in the stadium press box.

“We resolved three trespasses in the first week,” said Sgt. Wayne Beck, Security Systems Coordinator for the BYU campus police. “It’s a sure-fire way of catching people.”

After determining that a mix of thermal security cameras would provide the mix of 24/7 imaging quality and range performance, Sgt. Beck and the Brigham Young University team integrated the camera’s video outputs onto their existing security network, and tied everything together with a video analytics package.

BYU is securing their newly-renovated field with thermal security cameras for true 24/7 protection.



Conventional CCTV and lowlight “illuminated” cameras can’t see enough to provide adequate nighttime security. Thermal security cameras can.



Thermal security cameras give law enforcement the power to see intruders night and day.



One of the thermal security camera installed to watch over BYU’s LaVell Edwards Stadium.

The analytics allows operators to set up pre-determined alarm areas that are active at different times of day. For instance, during daylight hours, the perimeter and stands are open, and maintenance crews can access the field. Later in the afternoon, the stands are open but access to the field is closed and the field itself is alarmed. When school officials close the stadium for the day, they activate the automated surveillance and alarm system, which encompasses the entire facility.

If human activity is detected in a denied zone during any of these periods, alarms are triggered that alert campus police to respond accordingly. Once command center personnel receive an alarm, police dispatchers send officers to the scene. While these officers are enroute, dispatchers can bring up and direct optical PTZ cameras to the violated area in order to gather more tactical information the responding officers will need once they arrive on-scene.

The Thermal Advantage

Thermal cameras let security professionals see intruders clearly in total darkness, and through smoke, dust, and light fog. No matter what they need to see, or where they need to see it from, thermal cameras keep law enforcement and security officers seeing clearly.

The tactical and practical advantages of thermal as the best solution around for nighttime security imaging have been known for years. Their downside – until recently – has been that they were more expensive, requiring long budgetary intervals between acquisitions.

But the last few years have seen the cost of high-quality thermal security cameras come down dramatically, with models now available for under \$3,000, greatly expanding their use around the security industry in general, and in homeland security and critical infrastructure security applications in particular.

The acquisition cost of thermal security cameras being 10% of what they were a few short years ago is only part of the story. It doesn't take into account three important advantages of thermal cameras for homeland security applications: they don't require any support infrastructure, they provide true 24/7 operational imaging, and they act as force multiplication assets, dramatically improving operational response and efficiency.

Support Infrastructure

Economically, the costs involved in the design, installation, operation, and upkeep of a support infrastructure of lighting towers and illuminators quickly outstrips the acquisition cost of a network of thermal security cameras. Because they're not dependant on any visible light, thermal security cameras don't need auxiliary lighting to work, so they can provide effective virtual perimeters for a fraction of the cost of visible-light imagers.

Conventional CCTV cameras – even ones purporting to be "lowlight" – need an outside source of illumination if they're going to create an image after the sun goes down, leaving them with built-in limitations that are both economic and tactical.

Their main tactical limitation is that they can't generate images of intruders or targets beyond the range of their illumination source. This typically limits their effectiveness to a few hundred feet, when the tactical situation may require surveillance capability that stretches for miles. And, with roughly half of every day happening after the sun drops below the horizon, this leaves large facilities under-secured for large portions of the day.

24/7 Video Security Coverage

Thermal security cameras let people see what their eyes can't: invisible heat radiation emitted by all objects regardless of lighting conditions. They see the heat given off by everything under the sun. Everything we encounter in daily life creates heat energy, called a "heat signature," that thermal cameras can see clearly, detecting the minute temperature differences between objects, and turning them into video that displays on almost any TV monitor.

Because they see heat, not light, thermal cameras are effective law enforcement tools in any environment. They can easily detect intruders and other potential hazards to the security of people and infrastructure in any weather, as well as all day and all night.



Affordable IP thermal security cameras come in outdoor dome, fixed-site, and pan/tilt multi-sensor configurations.

Cameras that create images based on visible light, like conventional CCTV and illuminated cameras, have the advantage of creating images that are familiar and easy to interpret. Unfortunately, the ability of a given detector – be it in an eyeball or a camera – to create these images relates directly to the amount of light available.

Another limitation of cameras that create images from reflected visible light is contrast. Just like the human eye, these cameras create better images if the object they are looking for has lots of contrast compared to its background. If it doesn't, they won't be able to see it.

Because thermal cameras make pictures from heat, not light, and have nothing to do with sensing reflected visible-light energy, thermal cameras don't suffer from the limitations of standard CCTV and illuminated cameras.

Not only does everything have a heat signature, but these heat signatures create their own contrast, so the thermal energy seen by thermal cameras generally creates a better image at night than during the day. They work just fine during the day – as long as there is the tiniest bit of temperature contrast between an object and its background you can see it – but they work best at night.

An important tactical distinction to understand is that security operators, law enforcement officers, and federal agents aren't using thermal cameras to identify suspected criminals and terrorists. They use thermal cameras to detect the presence of people in restricted or suspect areas, assess the tactical situation, and respond accordingly. Because no one can hide their heat, thermal security cameras are the best tools officers and agents can use to know how many intruders they're facing, and consequently how many officers or agents should respond to meet the threat.

Force Multiplier

Thermal security cameras act as a force multiplier, allowing law enforcement and security operators to react more effectively – responding to threats with the appropriate force, and using agency resources more efficiently.

For instance, thermal security cameras have been widely adopted as the imaging technology of choice to answer federal regulations requiring unbroken video surveillance coverage like the Nuclear Regulatory Commission's requirement that nuclear facilities provide continuous 24-hour surveillance, observation, and monitoring of their perimeter and control areas. They have become an integral part of the Delay, Detect, Respond strategy; their increased detection range giving security forces more time to respond, contain, and neutralize adversaries before they can access or damage nuclear materials or facilities.

Because of their high-contrast video output, security professionals have found that thermal security cameras work very well with video analytics, providing more reliable alarming with fewer false reports than visible-light cameras, even during the day.

What The Future May Bring

From border security to surveillance around industrial facilities and campuses, security professionals are deploying thermal cameras in a dizzying array of applications to provide true 24-hour video surveillance coverage of critical areas. As a result of recent reductions in price and increases in capability, fixed-site, network-ready thermal cameras that cost more than \$30,000 only a few years ago are now available for less than \$3,000.

As the cost of thermal security technology continues to decline, as cameras themselves get smaller and smaller, applications for this technology will continue to grow.

One of the growing applications for thermal security cameras are as handheld devices, giving law enforcement officers and other security professionals the ability to carry this bleeding-edge technology with them wherever they go. Handheld thermal cameras designed for security and law enforcement roles are currently on the market for less than \$5,000, as well as vehicle-mounted thermal cameras that go for less than half that price.

What conclusions can we draw? Thermal security cameras offer the best 24/7 imaging range performance available. They are easily networked and work better with



Thermal security cameras can spot human activity from 10 miles away or more.

video analytics packages than other “lowligh” imaging solutions. They come in a variety of technologies and configurations, providing a solution for any high-security installation or border. Finally, they are inexpensive to operate, they require the installation of no auxiliary lighting infrastructure, and their acquisition costs are projected to continue their downward trend creating the “perfect storm” of affordability and return on investment.

In the end, however, it all comes down to performance. Thermal security cameras are the proven solution for networked video security systems. As BYU PD’s Sgt. Beck puts it, “For cost-effective intrusion detection, thermal works really well.”



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