

A Perimeter Protection System Fit For A World-Class Airport

Case study: Singapore Changi Airport



INTRODUCTION

Singapore Changi Airport (SIN), the international airport of Singapore, is rated the World's Best Airport by Skytrax for the sixth consecutive year since 2013. It is one of the world's busiest airports by international passenger and cargo traffic, and ranked in the world's top 5 in security screening.

With globalisation, civil airports have become an interconnection hub of countries; an aerial gateway and border of a country. Over the years, airports have increased interest and awareness in security systems to combat criminals and terrorist with ill-intentions.

As a world-class facility, Singapore Changi Airport places heavy emphasis in being reliable and ensuring public safety. In 2010, the airport management team started the search for an effective Perimeter Intrusion Detection System (PIDS), a solution that could meet critical requirements necessary for an airport's perimeter security.



CLIENT SITE INFORMATION

Perimeter length: 22 km

Type of fence: Double-layered |
Welded-mesh | Concrete kerb

Height of fence: 3 m, 4.5 m for
fence above canals/ drains

Width of fence: 2.43 m

CHALLENGES

- **Environmental and Aircraft Effects**
 Wind, rain, storms, jet blasts induce false alarms in a PIDS. A trade-off is usually made by decreasing its sensitivity. However, this means that when an intruder climbs the fence, be it free hand or with a leaning ladder, this true intrusion may not be detected.
- **Poor “Silent” Climb Detection Rate**
 Incapable of detecting intrusion with ladder assist, intrusions that are relatively quiet.
- **Poor Reliability** Typical close-loop systems have limited flexibility and physical control; when the fences are being repaired or PIDS maintenance is taking place, it would lead to extensive PIDS system downtime.
- **Vulnerability** Low probability of detecting tampering events, such as removal of cable ties to disable the PIDS.

CLIENT’S REQUIREMENTS

- **High Probability of Intrusion Detection** To be able to perform with > 90% detection rate of various relevant intrusion.
- **Low False/ Nuisance Alarm without Trade-off to Security** Maintain low false and nuisance alarm rates at all areas while preserving high probability of detection.
- **Pinpoint Accuracy for minimal response time** To achieve pinpoint accuracy down to 2 or 3 fence panels, instead of a zone.
- **Resilient to defeat** System should remain in operation and still be able to detect tampering attempts even when cable is cut.

AGILFENCE’S SOLUTION

During the evaluation phase, a comparative trial was held between AgilFence and two world-leading PIDS products, one microphonic-based and one phase interferometry-based, conducted by Singapore Police Force on a same stretch of fence line. The operational trial revealed severe weaknesses in the microphonic solution and the phase-interferometry solution, particularly with respect to the systems’ poor detection for both unaided and aided climb. On the other hand, **AgilFence PIDS’ results surpassed the competitors in terms of performance as well as the expectations of Singapore Police Force and Changi Airport Group.** Since February 2013, AgilFence PIDS has been deployed on 22 km of fencing along the Airport’s perimeter, plus all crash gates and dormant side gates. AgilFence PIDS provides detection of intrusion attempts for fence climb (aided or unaided), hole cutting in the fence fabric, and any cable cut or tampering attempt. All PIDS alarms automatically trigger the nearest PTZ camera to slew to the intrusion location pin-pointed by AgilFence PIDS.

AgilFence PIDS uses advanced fibre-based sensors embedded in the fibre optic cables, and the cables are mounted on fences and gates. The highly sensitive sensors are carefully packaged with armoured protection and UV-resistant jacket, and detects if it is being tampered with. The intelligent signal processing algorithm takes in real-time sensor inputs to adapt dynamically and automatically the threshold, so that false alarm rate from environment factors like strong wind is kept low.

- **Adaptability** AgilFence PIDS can be implemented on a variety of fence types; chain linked, welded mesh, palisade, solid wall, gates and drain gratings. The adaptability offered by AgilFence allowed full perimeter protection with just a single system.
- **Easy Deployment** It is a single-pass cable deployment of AgilFence PIDS fibre optic sensor cables using high-grade PVC cable ties on perimeter fencing. No electronics or power is required in the field, so there is no fear of any electromagnetic or radio frequency interference. The sensor cable is segmented into channels of 180 m, such that if there is a damage on one channel, only the damaged point to the end of the channel is down.



"We are pleased to have ST Electronics partner CAG in this effort to enhance the security of the Changi Airport airfield. At Changi, we take safety and security seriously and are committed to maintaining the highest standards. The implementation of AgilFence PIDS complements the security measures we already have in place to protect the airport perimeter. We are proud to support innovation by Singaporean organisations and be the first to use this groundbreaking technology."

Paired with the PIDS solution is **AgilFence Integrated Alarm Management System (iPAMS)**, capable of interacting with the airport's existing CCTV and Integrated Security Management Systems.

Mr. Foo Sek Min, EVP,
 Airport Management, Changi Airport Group

KEY SYSTEM PARAMETERS

Fence-line	:	3,000 discrete fibre sensors
CCTVs	:	x37 Low-light PTZ CCTV auto-triggered auto-slewed to intrusion location, < 60 sets to cover entire perimeter
PIDS Backend Equipment	:	8 sets, each comprising 1 Sensing Unit + 1 COTS PC Server
User Interface	:	Fully integrated with a major commercial ISMS, Genetec Security Centre
Operation	:	System monitored in the Airport Operation Centre (AOC), fully managed by a single operator

SUMMARY

The 22 km of fences that surround Changi Airport have been well-secured by the AgilFence Perimeter Intrusion Detection System since 2013. The system continues to monitor and detect intrusion attempts successfully.

Some facilities that seek the most economical solutions for their perimeter security will quickly realise that when intrusions occur undetected, the implications that follow after can come at the cost of safety risks and a company's reputation. With the rise in global terror incidence rate, places with high human traffic such as airports can no longer ignore the importance of implementing strict security measures. Frequent news of perimeter intrusion are strong indications that there is still a huge potential for improvement for many facilities, and these critical infrastructures are urged more than ever to invest in a trusted system that actually works.

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