SAMI SOLUTIONS

Hot In-Place Asphalt Recycling Department of Defence

HIPAR Solution No. 1

Recycling Darwin International Airport

A major construction constraint for SAT was that the airport had to remain operational at all times.

The total area of runway recycled using the Hot In-Place Asphalt Recycling Process (HIPAR) was 372,000 m^2.

The Department of Defence recently completed what is believed to be the largest single airport runway and taxiway recycling project in the world at Darwin International Airport.

A high volume facility servicing both domestic and international air traffic requirements, Darwin International Airport also doubles as a Department of Defence air base.

Its 372,000 m^2 network of asphalt pavement taxiways and runways, including one of the longest in Australia at nearly 3.5 km long, had an average age of more than 30 years.

With climatic conditions at Darwin being amongst the harshest in Australia for asphalt, much of the network was showing signs of extensive surface cracking which, if left unattended, would have led to further deterioration and subsequent structural failure.

With the extent of damage to the pavement being such that a standard asphalt overlay was out of the question, this left two options — either mill off the existing surface and replace it with a totally new asphalt surface or recycle the existing surface.

Milling off the existing surface and replacing it with new material would have been a costly and time-consuming process. It would also have been difficult to co-ordinate the different processes given that a prime requirement was that the airfield should remain operational at all times.

Awarding the contract

Prior to making its decision, the Department of Defence, which is responsible for the airport's infrastructure, and its Contract Superintendent, Australian Construction Services (ACS), thoroughly investigated the use of asphalt pavement recycling technology in Australia and overseas. From what they saw, they decided recycling offered the greatest potential for the project and the contract for the full recycling of the airport's runway and taxiway network was won by SAT.

The project was to be a first in a number of ways.

In addition to being what is believed to be the first project of its type attempted anywhere in the world, it was certainly to be the biggest asphalt pavement recycling project ever undertaken in Australia.

Because of the pioneering nature of the project, a major component of SAT's tender was the desire to establish a "Partnering Agreement".

This was readily accepted by the Department of Defence and ACS and played a major role in the successful outcome of the project.

The "Partnering Agreement" engendered a great team spirit and, because all the various contractors and subcontractors had identified methods and procedures for problem solving, no single issue ever dragged on or delayed the project to any extent.

Design

The pavement design was carried out by independent pavement specialist, CERTS International, with assistance from the Department of Defence and ACS.

Recycling an asphalt pavement requires significant pre-engineering.

The existing asphalt pavement consisted of a 25 mm thick layer of material with 10 mm aggregate, placed over the top of a 50 mm thick layer containing 20 mm aggregate. As the recycling process involved removing 50 mm of the existing surface, this meant the resultant mix of 10 mm and 20 mm aggregates would have produced a pavement with an inappropriate grading curve.

With the desired result being continuously graded 14 mm aggregate recycled asphalt; a beneficiating mix was designed to be added to the recycled material.

CERTS began work on the pavement design in November 1993, with the recycling contract being let to SAT in early 1994.

Construction

Work commenced on site in May 1994 and was completed by the beginning of August.

SAT's equipment for the project included three pre-heating machines and two full size asphalt pavement recycling machines capable of recycling 4.5 m wide sections of pavement in a single pass, plus a range of conventional

asphalt pavement construction equipment such as steel and rubber-tyred rollers.

Initially workinga 12 hourshift six days a week, SAT switched over to around the clock operation after running into unexpected problems with an excessively high moisture content in the asphalt. While this slowed the recycling rate down, SAT was still able to meet its contractual commitments, completing the projectjust a couple of days over the target date and within the overall financial expectations of the Department of Defence.

The end result was a totally recycled runway and taxiway network with a design life equivalent to that of a totally new asphalt surface.

In total, around 6500 tonnes of beneficiating mix was used in conjunction with specialised bitumen rejuvenators to create the desired pavement grading curve and restore the bitumen properties.

Dealing with emergencies

A major construction constraint for SAT was that the airport was to remain operational at all times. This meant scheduling took on even greater importance and it was in areas like these that the partnering concept really came into play.

SAT had up to three meetings a week with the Project Superintendent and representatives from the Federal Airports Corporation and the Department of Defence just scheduling where and when it could work.

A number of unexpected aircraft emergencies during the construction phase of the project demonstrated another advantage of the HIPAR process for airport runway and taxiway recycling.

On four occasions, SAT had to immediately stop work and get all the equipment and personnel off the runway as fast as possible — this took under 20 minutes on each occasion.

Because the HIPAR process involves scarifying the existing material, rejuvenating it, and putting it back in place, there are no ramps, steps, lips or edges to worry about when the mobile recycling unit comes to a stop.

Other asphalt pavement rehabilitation processes require ramps to be constructed between the new material and the scarified surface and generate lips and edges during paving, all of which need to be cut back and rolled out before it would be totally safe for aircraft to land— a sequence of events which would probably take more than one hour to complete

• time which is generally not available when emergencies arise.

Quality Assurance

With the project being the first of its type and scale ever attempted in Australia, SAT was keen to ensure that the quality was first-class and sub-contracted the Quality Assurance component of its contract to the Queensland Department of Transport which established and manned an on-site QA Testing Laboratory.

Daily QA testing included:

• 4 bitumen contents and grading tests
• 4 Marshall tests
• 2 Maximum Density Determinations
• A grid of nuclear density results and test coring.

Summary

The successful completion of the Darwin International Airport asphalt pavement recycling project is a first for Australia and enabled the Department of Defence to achieve a considerable saving over the costoftraditional asphalt pavement rehabilitation methods.

The project was also an example of how to minimise the environmental impact of conventional asphalt pavement rehabilitation practices.

Had conventional milling and resurfacing techniques been used, the project would have required the removal and disposal of more than 46,000 tonnes of material and the placement of more than 46,000 tonnes of new asphalt.

As it was, the project was completed with the use of just 6500 tonnes of beneficiating mix. There was no waste to dispose of and there is no reason why the asphalt pavement could not be recycled again at the end of its design life.

In summary, HIPAR is an economically and ecologically sustainable method of rehabilitating worn and damaged asphalt surfaces.

It reduces the overall cost of the project and provides other advantages including rapid construction, less disruption, immediate use and a host of environmental benefits.

SAMI

For further information on any of the products featured in this Case Study or any of SAMI's other specialist road maintenance products and services, please contact:
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