

# VARIABLE SPEED DRIVES AT ASCEND COMMUNICATIONS INTERNATIONAL



**Ascend Communications International (formerly Stratus Computer) occupies a modern, 10,000 m<sup>2</sup> facility in Blanchardstown, Dublin, which is now the main manufacturing unit for the organisation's worldwide markets. The company, a manufacturer of continuously available, fault-tolerant computers, now employs 260 people and has been in operation since 1989.**

Energy has received a high priority in the management of plant operating costs because of the need to create and maintain the desired working conditions using HVAC equipment and because it was recognised that improved energy efficiency could result in significant cost savings. With this objective in mind, the VSD project was one of a number of initiatives that the company identified and implemented.

**FIG 1. ROOF-MOUNTED AHUs**



The plant facilities include 11 Air Handling Units (AHUs), each incorporating supply and return air fans. Eight AHUs are roof-mounted in weather-proof enclosures (Fig. 1) and arranged in pairs with

common access, which includes power distribution and control boards, heating and cooling connections and controls.

The building environment control is based on a variable air volume design. Prior to the retrofit, fan air volume was controlled by motorised inlet guide vanes. The fans, which are double inlet, centrifugal type, with backward-curved blades, originally ran at full speed and were fed via time-clock control, in line with plant operational needs.

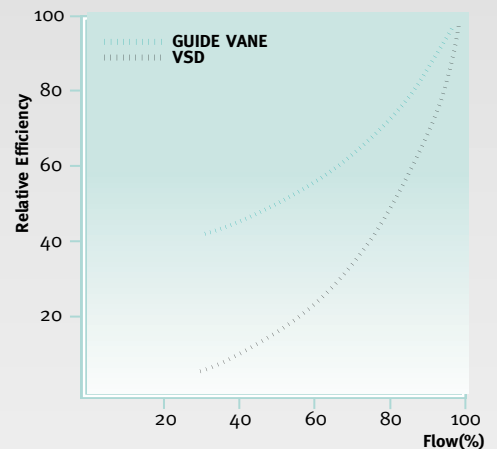
The mechanism for the guide vane system on the fans required frequent adjustment; shut-down of the AHU for maintenance purposes inevitably resulted in a significant temperature rise in the work area served, creating undesirable working conditions.

Variable speed drives were identified as a more efficient alternative to fan inlet guide vane control for eight AHUs. Figure 2 illustrates. The potential for a reduction in plant max. demand kW was also identified.

### CONFIRMATION OF POTENTIAL SAVINGS - TEST CASE

AHU # 1 was selected as a test case, and an energy analyser was connected to the motor supply. The average load recorded over 1 week was 26 kW, shared between supply and return fan motors. Max demand kW of AHU # 1 and 3 drives was also recorded during this data-gathering phase.

**FIG 2. ENERGY SAVING - GUIDE VANE vs. VSD CONTROL**



**TABLE 1**

AIR HANDLING UNITS - FAN MOTOR RATING					
AHU #	SUPPLY		RETURN		Type
	RPM	kW	RPM	kW	
1	1475	30	1455	15	SCI
2	1475	30	1455	15	SCI
3	1460	55	1460	37	SCI
4	1460	55	1460	37	SCI
5	1475	30	1420	15	SCI
6	1475	30	1420	15	SCI
7	1475	30	1420	15	SCI
8	1475	18.5	1420	11	SCI



The Power/Flow curves for supply and Return air fans were found to be similar, so it was decided to test with one inverter VSD supplying both motors in parallel on AHU # 1, and the guide vane system on the inlet of both fans was removed. The average load recorded for 1 week under these conditions was 9 kW, i.e. a reduction of 65% in power consumption.

Although this differential was greater than would be expected in the longer term, the test indicated that worthwhile savings were achievable.

In addition to energy savings, the following potential savings categories were identified and considered applicable to all eight AHUs:

- (i) Reduction in demand charges, as illustrated in table 2
- (ii) Reduction in heat gain, due to motors running at lower power - HVAC systems at Ascend normally run in cooling mode
- (iii) Reduction in maintenance costs, due to reduced load, increased belt life and elimination of guide vane system.

**FIG 3. AHU#4 - Supply Fan and 55 kW Motor**



### PROJECT IMPLEMENTATION

Following approval of the project, quotations on the inverter drives were sought from several suppliers.

The VSD installation was tackled one AHU at a time and involved installation of the drive cabinet, mounted on the frame of the AHU and adjacent to the fans (see figure 3) and reprogramming of the BEMS (Strategies and Graphics). The 0-10 V output signal from the BEMS was simply disconnected from the guide vane pilot motor control and connected to the VSD control input. The control system was programmed to avoid simultaneous start-up of fans.

Installation took two days per AHU. All aspects of the project were complete by August 1995 and savings, compared with guide-vane arrangement, were incorporated into a daily update on the BEMS.

No major problem was encountered during the implementation of the project.

### FINANCIAL RESULTS

Table 2 summarises the financial outcome at project completion.

The actual savings, as detailed in Table 2, represent a 48% reduction in costs associated with operation of AHUs # 1 to 8 (running hours as per pre-project). With an installation cost of £33,400 and savings of £33,100, the project pay-back was just one year.

**TABLE 2. SAVINGS AT PROJECT COMPLETION**

<b>Average Load Reduction - 8 AHUs:</b>	159.0 kW
<b>Energy Savings Per Year:</b>	£31,200
<b>Savings in Heat Gain:</b>	£823
<b>Maintenance Savings</b>	£1,160
<b>TOTAL:</b>	<b>£33,183</b>

Table 3 shows the load reduction by individual drive for VSD versus guide vane control of fan air flow, as recorded on the BEMS, following project completion. Also shown are actual VSD kW load figures.

**TABLE 3. AHU POWER REDUCTION**

AHU No.	Rated Motor kW	Guide Vane kW	VSD kW	Hz
1	45	32	15.8	29
2	45	32	24	-
3	92	54	23.3	29.2
4	92	54	20	23.5
5	45	40	20	23.5
6	45	40	20	23.5
7	45	40	20	23.1
8	29.5	29	18	32.2

### IMPACT OF INCREASED PRODUCTION

Since October 1995, production capacity of the plant has been increased by 40%, accompanied by an increase in staff numbers. As a consequence, annual operating hours of the AHUs have been increased. Due to increased operating hours, in excess of £50,000 p.a. is now being saved, due to this project.

### CONCLUSION

Since project completion, the drives and AHU systems have operated reliably. The project amply demonstrates the benefits of inverter VSDs applied to HVAC systems.

For further information on VSD's, and other energy saving technologies and initiatives, contact:



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