THE BIG CHILL: INITIAL EFFORT TO SAVE OPERATING COSTS TURNED A COMPLEX PROJECT INTO AN INNOVATIVE, GREEN EFFORT AND SUSTAINABILITY

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ABSTRACT. Since its 1989 opening, chillers operating at the 245,000 ft² Terminal of the Sarasota Bradenton International Airport (Airport), owned and operated by the Sarasota Manatee Airport Authority (Authority), Sarasota, Florida, were nearing the end of their normal economic operating life. The procurement challenge was to acquire new chillers that could meet or exceed existing 3 unit's capacity and energy costs to avoid an increase in operating expenses, thus avoiding an increase in airline landing fees.

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INTRODUCTION

In 2007, the Authority started planning a "Capital Maintenance Project" to address improvements and modifications in the Airport's Terminal Building which would be reaching 20 years old in 2009. The Project involved replacing primary infrastructure components of the building and upgrading items such as the heating, ventilation and air conditioning (HVAC) systems, building restrooms, finishes and flooring, etc. The Authority had a continuous agreement with McQuay for annual maintenance to the HVAC chillers since 1989.

In the spring of 2009, the Authority's Facilities staff was made aware of the fact that Daiken McQuay had a new type of chiller unit in research and development and that McQuay had an interest in a beta test site for this new technology. Given the Project under way, the senior Airport staff pursued this item with McQuay and found that McQuay was looking for a site near an airport and one that was in a secure location. The Airport met both criteria and discussions ensued.

The Authority was interested in replacing the 619 and 530 ton chiller units and retaining the 328 ton unit as a backup unit. McQuay was found to be the only vendor capable of meeting the Airport's specifications for a 500 ton range unit having the new "Variable Speed – Magnetic Bearing" water cooled technology. This single source vendor allowed for the Authority's Board to waive the competitive bidding process.
There is one manufacturer that provides magnetic bearing chillers below 400 tons (Turbocor) and one that provides it in very large tonnage capacity 6000+ (York International).

During the market analysis stage of the procurement, the Airport discovered this new technology uses magnetic force (magnetic levitation) to keep the chiller's internal drive shaft in a near friction free state of operation. This new technology eliminates the need for what had been numerous components and creates a number of advantages. Some of those advantages include:

1). Average chiller life cycle is projected to be at least 5+ years longer.
2). Eliminates need for annual oil inspection and periodic oil changes.
3). Less moving parts. Eliminates need for transmission, gears and oil pumps/coolers.
4). More energy efficient. The estimated electrical load reduction for the chillers was 30% or potentially a $42,000 annual savings for the Terminal operation. McQuay stated that it preferred that the Authority's power provider, FP&L, be involved to verify projected savings.
5). LEED qualified.
6). Eliminates 3-8% efficiency degradation associated with oil lubricated models.
7). Eliminates need for maintenance agreement for next five years saving $109,380.00. Total five year electrical and maintenance savings $319,380 minimum.

The Authority's staff completed a thorough evaluation of the proposed McQuay offer to become a beta test site for the new Variable Speed – Magnetic Bearing Chiller unit. Analysis involved replacing one and/or two existing Terminal chiller units by documenting the process in terms of: environmental friendliness, life-cycle costing, the elimination of losses from oil-fed bearings, gear box energy reduction, reduction in energy losses in motors (permanent magnet motors can achieve 98% efficiency), and utilizing integrated variable frequency drives. Life Cycle Analyses showed a Net Present Value (NPV) of $593,368.09, with a simple payback of 4.76 years for a single unit, and $1,586,254.67 NPV and 5.23 years simple payback for 2 units.

Staff placed this item on the Authority's Board agenda on August 24, 2009. The Board approved purchase of two (2) new 500 ton Daikin McQuay Magnitude magnetic bearing BETA WMC500 Chillers. The Authority executed Field Trial Customer Agreement, Demonstration Site Participation, Satisfaction Promise and Confidentiality Agreement. Turn-key project total: $423,900 including labor, materials and equipment; removal of structural elements for Ingress/Egress, demolition & removal of existing units, piping modification, electrical reconfiguration, personalized operator

training, extended parts and labor for five (5) years, software updates for five (5) years. In addition, the McQuay Agreement stated that all work was to commence in October 2009 and be complete prior to November 18, 2009 to accommodate the Airport's peak travel period for the Thanksgiving holiday.

The following points summarize some of the key Agreement components:

Its performance contributes to possible LEED points; uses HFC-134a refrigerant that has no ozone depleting potential.

Annual Electrical HVAC Energy Savings 28%

Life Cycle Analysis Net Present Value of $1,586,254

ROI 5.2 years

Annual Maintenance Contract Costs reduced 72%

Reduced Cooling Tower Chemicals and Water Consumption

Additional Project Savings:

$ 7,000 – single site work project (replacement of both units installed at the same time)

$ 6,000 – 2.4% advance pre-payment discount

$10,000 discount – from existing Annual Maintenance Agreement, this savings applied to Inspection Panel & Maintenance Agreement

600 lbs.R-134 Refrigerant – existing refrigerant from old units captured and reused

METHODS

Public contracting and procurement involves thorough planning and knowledge of best practices to determine the prudent course and plan of action.....

Three (3)separate contracts ….Beginning with Johnson Controls (the Airport's Metasys provider), we required justification and backup for a payout for the remaining services. One contract required an amendment. Upon negotiation, we reduced an existing original contract term from July 1, 2009 – December 31, 2009 with Johnson Controls $13,060 Metasys portion and $25, 076 Fire Detection for premium service, a standard monthly fee ($3178) which included repair labor but not the repair parts.

McQuay Services (prior to becoming DAIKIN McQuay), our existing chiller maintenance contract for the three chillers, the Authority received a credit, which was utilized toward the Inspection Maintenance for the new Beta chillers: $5,900 credit applied Dec. 1, 2009-Nov. 30,2010, Year 2, Dec. 1-2010 – Nov. 30, 2011 remaining credit balance applied plus $862 due from Authority)
($29,500 - $10,938 credit = $$18,562 Total contract amount)
The Authority executed a contract and purchase order for Inspection Maintenance Services for a term of five (5) years beginning December 1, 2009 through November 30, 2014.
Authority engaged the Contractor to supplement the 5-year warranty on the 2 each 500 ton McQuay Model WME500 Centrifugal Chillers with a quarterly and annual Inspection Maintenance Agreement inclusive of emergency response services 24 hours a day, seven days a week including holidays; and original contract approved by the Board on August, 24, 2009 (Item 5.G #W-090217 MCQUAY INTERNATIONAL, CHILLER FIELD TRIAL), and, with accepted principles and techniques used to cover three operational and one annual service inspection maintenance and emergency response services for each chiller, including head removal: McQuay BETA 500 ton magnetic bearing centrifugal (WME500) chiller with advanced oil-free compressor design

A. #1 Chiller, 500 ton, Model C3012BLYY2-A, s/n 509J007500
B. #3 Chiller, 500 ton, Model C3012BLYY2-A, s/n 509J007200

and in compliance with all state and local regulations, the Contractor shall provide the following services: furnish all equipment, tools,

parts, material, refrigerant oil, skill, and labor of every description necessary to carry out and complete in good, substantial, and workmanlike manner the work specified per documents and the purchase order to proceed.

RESULTS

Public Government and Private Sector Partnership

As a result of the private sector reaching out to the public sector …

Per Board action, the Authority executed Field Trial Customer Agreement, Demonstration Site Participation, Satisfaction Promise and Confidentiality Agreement. Turn-key project total: $423,900 including labor, materials and equipment; removal of structural elements for Ingress/Egress, demolition & removal of existing units, piping modification, electrical reconfiguration, personalized operator training, extended parts and labor for five (5) years, software updates for five (5) years.

Life Cycle Analyses shows a Net Present Value (NPV) of $593,368.09, with a simple payback of 4.76 years for a single unit, and $1,586,254.67 NPV and 5.23 years simple payback for 2 units.

DISCUSSIONS

Measuring Success

An interesting note during our first budget meeting since completion, September 2011, specific mention of expense reductions with LED light bulbs and the new chiller installation, including the energy savings, enabled the airport to further decrease the landing fee from 83 cents to 69 cents per 1,000 pounds. Thus, we avoided an increase in the landing fees for airlines.

Through further review, with usage and collaboration with Florida Power and Light (FPL) additional savings have been realized. The Authority monitors power consumption on a monthly basis to evaluate annual savings.

REFERENCES

PUBLIC RECORDS NOTICE

All information, contracts, purchase orders related to subject herein, including content, are subject to the provisions of the Florida Public Records Law, Florida Statute Chapter 119, and may be subject to disclosure.