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| Title/category: | Drive technology |
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| Sub-Title: | Efficient IE2 motors for cost-effective climate control in airports |
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2 ***"We ensure a good climate", is the mission statement of the***
3 ***technology leader in the HVAC sector. However, good air quality***
4 ***comes at a cost: This is why for many years now the company***
5 ***has chosen energy-saving components. They have been using***
6 ***IE2 as standard for a long time now in order to reduce operating***
7 ***costs to a minimum. The largest German airport also enjoys the***
8 ***benefits of the high energy efficiency.***

8 The trend to save energy can be observed in many sectors. HVAC
9 systems are certainly no exception. For more than 30 years now,
10 Menerga GmbH located in Mülheim an der Ruhr, Germany, has been
11 concentrating on minimum energy applications. Based on its decades
12 of know-how, the company sees itself as innovation leader in HVAC
13 systems and offers sustainable efficiency.

14 The objective is that new technologies and energy-saving solutions
15 establish themselves as quickly as possible in the field. Effective
16 systems to recover thermal energy have proven themselves,
17 especially in climate control systems for indoor swimming pools, one
18 of the key business areas for this company. As of result of this
19 competence, this climate control specialist now has sales offices in
20 25 countries around the globe. Menerga sets itself apart as it typically
21 supplies complete solutions. The reason for this is that only with
22 completely harmonized and coordinated units can considerable
23 amounts of energy be saved.

24 These practical experts know that the capital investment costs for
25 HVAC systems are only secondary. The operating costs are far more
26 decisive, and here the energy usage represents the largest
27 percentage. This is the reason that for over 10 years now, the
28 company has been supplying Siemens IE2 motors as part of their
29 drive solution. Ralph Berger, Head of Research and Development
30 with Menerga explained: "Even back then, approximately ten percent
31 of our customers selected energy-saving drive alternatives – with an
32 increasing trend."

Efficiency class IE2 is mandatory

34 For airflow rates from approximately 5000 m³/h and higher, high-
36 efficiency three-phase induction motors represent an extremely good
38 solution, explained the two experts, who have a wealth of practical
40 experience. Further, EU Regulation 640/2009 stipulates that all
systems in this area are equipped with energy-saving IE2 or IE3
motors. This is because since June 16, 2011, only three-phase
induction motors with efficiency class IE2 or higher may be marketed
in the European Union (EU).

42 Generally, Menerga only integrates products that fulfill the presently
44 applicable highest standards. As a consequence, the company does
46 not have to retrofit or re-equip the customized climate control units to
comply with country-specific regulations. "This speeds up the
workflow and increases the cost effectiveness, and at the same time,
complies with the applicable energy-saving regulations.

48 A good example for the use of energy-saving drives is the climate
50 control system in Frankfurt Airport (Fraport AG). There, an existing
52 pier (Fraport "root" or junction) was refurbished and a second pier
was built to accommodate the currently largest passenger aircraft in
commercial operation in the world, the A380 (pier A-Plus). Each of
54 the 55 Adsolair climate control systems deployed there has two or
four radial fans for airflow rates of 10,000 and 50,000 m³/h. These are
56 driven by standard 1LE1 and 1LA9 Simotics motors from Siemens
with IE2 efficiency.

First-class bearings

58 These motors directly drive the fan impellers in order to achieve the
60 optimum combination of cost effectiveness, service friendliness and
62 controllability. For the heavy fans weighing several hundred
kilograms, with their correspondingly high mass moment of inertia, in
64 addition to the high power capability and energy efficiency of the
motors, Ralph Berger emphasized that there is also another quite
important issue: "Siemens uses bearings with outstanding quality for
its motors, and as a consequence we have no wear, service or
66 maintenance problems at any of the operational fan units."

According to the experience of the specialists, the jump from IE1 to
68 IE2 in the current projects is associated with an effective energy
saving of between four and five percent. This adds up to a huge value
70 in applications operating 8760 hours a year. Many of the Menerga
units operate for 8760 hours per annum, i.e. around the clock. In
72 addition to airports, climate control equipment is also used around-
the-clock in hospitals, swimming pools and IT systems – and in many
74 other areas. Motor manufacturer Siemens makes the following
general statement regarding what this actually means: Energy costs
76 represent approximately 97 percent of the lifecycle costs of a motor,
while the capital investment costs represent only three percent.

Energy-saving motors with innovative rotors

80 For instance, the Simotics family includes the 1LE1 series of motors
with innovative rotor technology. As a result of this innovative

82 technology, Siemens is able to offer IE2 motors with the same frame
83 dimensions as the previous IE1 version. The advantage: When
84 making a change, it is not necessary to modify system and machine
85 designs. It is important to note that IE2 motors have an efficiency that
86 is between one and seven percent higher than IE1 motors.

86 In Frankfurt airport, the units from Mülheim an der Ruhr provide 100
87 percent of the climate control¹. The building sensors in the building
88 control system specify the airflow required. Using the frequency
89 converters, only *that* power is provided, which is actually required at a
90 particular point in time. The base load is maintained over 24 hours;
91 the demand only quickly peaks when aircraft arrive and depart. A
92 sophisticated climate control system comes into its own especially for
93 these types of peak loads.

94 According to experts, throttle-based systems to control the airflow are
95 still being used today. This results in high energy usage and means
96 that controllability is only possible within certain limits. On the other
97 hand, since the company was founded over 30 years ago, Menerga
98 has been using variable-speed fan systems; these have been used
99 as standard for 15 years now.

100 **Control systems that guarantee a high degree of flexibility**

101 Further, the company has developed its own control solution, which
102 allows it to flexibly and quickly address all requirements. According to
103 Menerga this also has BACnet certification². This core competence
104 increases the level of competitiveness and cost effectiveness of the
105 company. One example is the ALMA³ research project, where the
106 climate for 66 telescopes must be controlled in the Atacama desert in
107 Chile. To meet the stringent requirements prevailing at the
108 Chajnantor high plateau at an altitude of 5100 m, Menerga explained
109 that in the end they were the only climate control supplier able to
110 present an adequate solution.

111 Even if the customized climate control solutions from Menerga have
112 higher capital investment costs than the previous standard solutions,
113 they turn out to have more favorable overall costs for end users. As
114 previously explained, the systematic integration of better and state-of-
115 the-art technology, which is combined to form a complete energy-
116 saving system, is decisive. This is why Menerga works closely with
117 companies like Siemens that share the same ideology as Menerga.

118 **Energy saving with efficiency class IE2**

119 Menerga GmbH in Mülheim an der Ruhr, Germany was founded back
120 in 1980 with a workforce of just 17. It has grown to become a
121 medium-sized company with approximately 460 employees. This
122 continuous positive development is also based on their philosophy

¹ Temperature, humidity and air quality; the room temperature is generally approx. 22 °C with a [relative air humidity](#) of approx. 50%

² standard certification of the American and European BACnet Groups to comply with energy efficiency guidelines

³ Atacama Large Millimeter/Submillimeter Array

124 that state-of-the-art technology can be leveraged to create energy-
saving solutions.

126 As technology leader in HVAC systems, the company provides ready-
to-install, complete solutions. The use of energy-saving three-phase
128 induction motors represented an important milestone in the
company's history. Up to 11 kW, 1LE1 and 1LA9 Simotics low-
voltage motors from Siemens are used as standard. Clearly
130 understanding that their climate control systems are operated for long
periods of time, they already offered efficiency class IE2 many years
132 ago. Today, one hundred percent of the systems are equipped with
IE2 motors.

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Captions:



138 *For the climate control of the new A-Plus pier and an additional pier*
140 *refurbishment, Menerga supplied 55 energy-saving Adsolair climate*
control units ready for installation – here, the last system belonging to
the complete order shortly before being transported to Frankfurt.

142 Fig._1A: Menerga





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The IE2 motors from Siemens are directly coupled to the heavy radial fans weighing several hundred kilograms. This configuration is simply possible as a result of the first class motor bearings.

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Photo: Siemens



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LE1 Simotics motors with efficiency class IE2 are just as compact as the IE1 version. This is why the mechanical design does not have to be modified when making a change to IE2.

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Photo: Siemens

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