Electric Motor Systems
EMSA

DANISH
TECHNOLOGICAL
INSTITUTE

May 2014

Example 2,
Use of the Motor Systems Tool – an energy advisory case

Situation A:

You are an energy adviser. One day the encounter a fan installation. The installation is a three-phase motor driving a fan directly. The facility at where you are is well equipped and is able to provide the datasheet for the fan (see page 2). The motor nameplate can be read on site:

50 Hz, 5.5kW, 380V, 12A, cos phi 0.83, 1425 rpm.

Using your multi-meter, you find the power consumption of the installation to be 6.15 kW. From the fan curve, electrical measurement and you knowledge of motors we can take a qualified guess of the amount of air delivered by the fan:

_____ m3/s at a differential pressure of _____ pa

These numbers are verified on site. Having interviewed the operating personnel of the machine and by measuring actual duty points the following load profile is established:

1. Highest flow: P1 = 5.40 kW for 500 hours/year
2. Lower flow: P1 = 6.15 kW for 1800 hours/year
3. Lower flow: P1 = 5.82 kW for 1800 hours/year
4. Lowest flow: P1 = 5.34 kW for 2500 hours/year

What is the annual power consumption in the current situation?

What would the annual power consumption be if the motor was replaced by an IE2 motor? (IE1, IE3?)

Annual savings with IE2 (same load profile): _____ kWh (IE1, IE3?)

Situation B

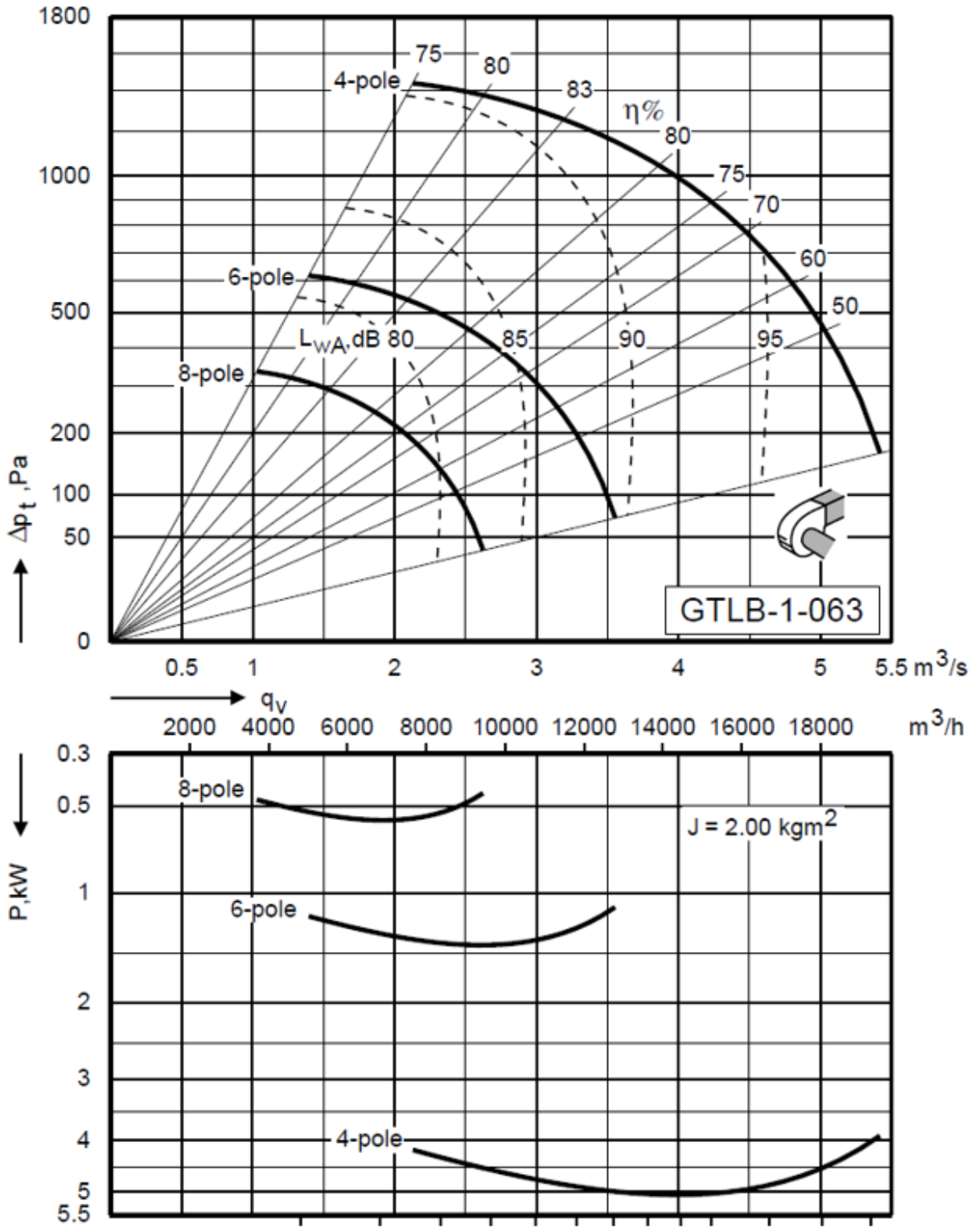
Imagine the same situation but in this case the fan, for mechanical reasons, is driven by two belts (XPB narrow cogged, both pulleys Ø140). With unchanged hydraulic conditions (P4) the "new" load profile would look like this:

1. Highest flow: P1 = 5.85 kW for 500 hours/year
2. Lower flow: P1 = 6.63 kW for 1800 hours/year
3. Lower flow: P1 = 6.29 kW for 1800 hours/year
4. Lowest flow: P1 = 5.79 kW for 2500 hours/year

What would be an obvious action for saving energy – and why?

What would the savings potential be for this action?

What would the total savings of these actions be considering both replacement of belt and motor IE2? (IE3?)


1800
1000
500
200
100
50
0
Δpt ,Pa
75
80
4-pole
83
η%
80
75
70
60
50
6-pole
LWA,dB 80
85
90
95
8-pole
GTLB-1-063
0.5
1
2
3
4
5
5.5 m3/s
qV
2000
4000
6000
8000
10000
12000
14000
16000
18000
m3/h
0.3
0.5
1
2
3
4
5
5.5
P,kW
8-pole
J = 2.00 kgm2
6-pole
4-pole