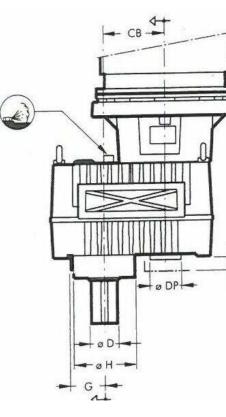
Gear boxes for ACC applications



Gear boxes are used for fan-drives in ACC's For motor power in exces of 30 kW, or 40 HP, Gear boxes are used instead of V-belt drives.

With the correct selection and maintenance, the life span of a good gear box is 15 to 20 years, or longer.

Items to be investigated for the selection

The following data must be used to perform a gear-box selection

- 1. The fan shaft power.
- 2. Power absorbed during worst conditions e.g. storm
- 3. Inverter installed and range or DOL
- 4. Service factor
- 5. Lubrication
- 6. Vibrations
- 7. Temperature min/max

Gear Box Power

The fan shaft power must be given any time With the service factor selected we get the AGMA Power. Thermal power, to eject the heat generated inside the gear box.

Fan shaft power	75 kW
Motor Power incl. power losses in the gear box	
and motor	75 x 1.1=82.5
Power increase during cold ambient temp.	82.5 x 1,1= 90.75
Service factor selected	2.2
Agma Power	2.2 x 90.75=199.65
Thermal power	195 kW

Service factor

The service factor is the factor with what the calculated power is muliplied for safety reasons.

This allows for vibrations, extreme conditions, start-up power and wear.

In most cases the selected service factor is between 2 and 3.

Note.

If a frequency inverter is used the service factor can be smaller.

With an inverter start-ups and stops can be controlled with ramping, this eliminates greatly the acceleration and de-acceleration forces .

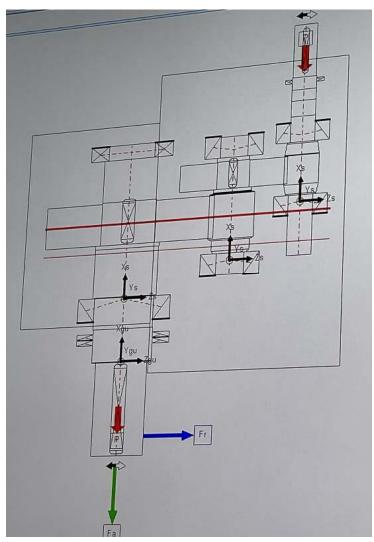
The service factor is valid for:

- Gears
- Bearings
- Shafts
- Housing

Thermal Power

The thermal power is the heat generated inside the gearbox. This heat must be transferred to the air flowing around the gearbox. As the air flowing around the gear-box has a velocity of 1m/sec special care must be given. We must also realise that the air will flow downwards in the center of the fan. Using an acoustic cover, forced draught cooling must be applied.

Forces in Gear box



The ilustration shows the main forces inside the gear box

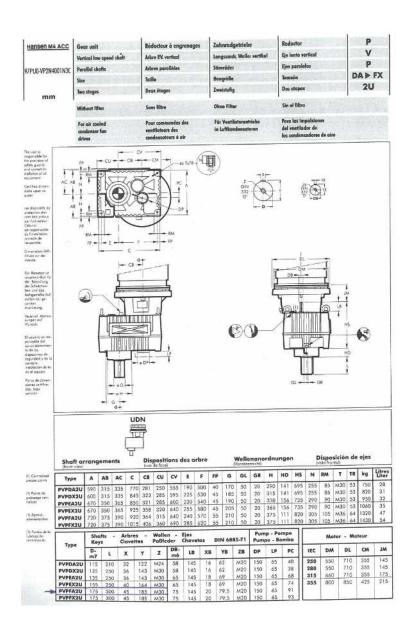
Selection of gear box

The selection of a gear box has the following steps.

- 1. Select the ratio, list 1
- 2. Select the RPM of motor, list 1
 - 3. Select the power, list 1
- 4. Devide this power listed by selected SF = < motor power
 - 5. Look up the right type in list 2 for dimensions

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	1200	135	340	440	500 420	650 540	780 650	980 820	26,5	24 25	40	39	50 50	60 60							
	900	100	260	330	380	490	590	740	27.5	25.5	42	39	60	60	0.0454	0,1018	0,1267	0,2012	0,5615	0,414	
	750	83	215	275	320	410	490	ó20	29	27	43	41	60	60	-			1.000		-	
	1800	180	460	520	670	760	920	1150	24	23,5 24,5	36 38	35	60 60	60 60	9.916	9.9755	10.1741	9,8311	10.1653	9,581	
	1500	150	380 300	450 380	560 450	570	670	860	22.5	24.5	40	38	60	60	1.00		10,0111		1.000	100	
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	1200	75	165	245	240	300	370	470	30	28.5	45	44	60	60							
	900	56	150	185	215	275	330	420	30	29,5	45	44	60	60	0,0334	0,0458	0,0547	0,0913	1,1285	\$,178	
	750	47	125	150	180	230	280	360	30	30	45	45	40 40	60 60	-	-			-	-	
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	900	45	94	145	145	190	205	285	30	30	45	45	60	60	0,0274	0,0309	0,0526	0,0588	0,109	0,122	
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Sheet 1



Sheet 2

Lubrication

Lubrication could be with mineral oil or synthtic oil.

- Mineral oil does have an temperature range smaller that synthetic oil.
- Also mineral oil will wear faster that synthetic oil.
- For this reason we mostly advice to use synthetic oil.
- For most applications with a ambient temperature range of -15 to 40 C synthetic oil ISO VG 220 can be used.
- For locations with a different temperature range ISO VG 320 or ISO VG 150 can be used.



Humidity in oil

One of the most important measures to protect the gear box is preventing humidity (water) to be mixed with the oil.

As the gearbox is subject to different temperatures, outside air, with



humidity or vapor, can enter the gear box.

Water in the oil can make micro welds on the teath of the gears.

This can create pit wear and damage to the gears and especially the bearings (less contact surface).

> Suitable Silicagel filters must be used to dry the incoming air.

Vibrations

Vibration are always present.

The fan is a rotating device with mostly a small unbalance.

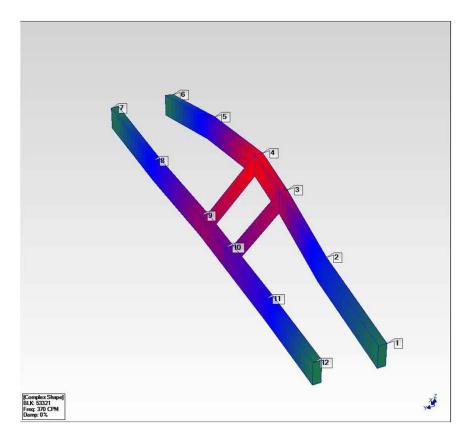
To get rid of all the unbalances is virtually impossible, there will always be a small unbalance present.

A small vibration is no problem as long as the frequencies are not near the own frequency of the stucture.

This is applicable for:

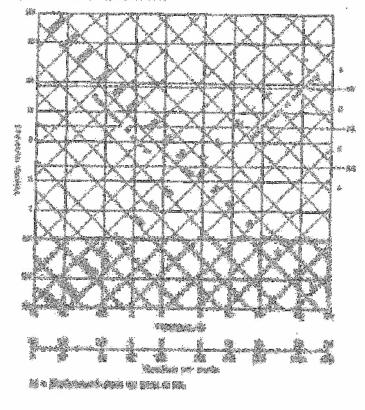
- The fan bridge
- Steel support structure.

Deformations of fan bridge



Allowable Vibrations

filegricine for administry beauting attractions.



Thank you for your attention

For more information,

You can contact ACC Team, mail <u>huubh@acc-team.com</u>