Comparison Between *oms* Hypodrive Gear Units EC 2-7 / 15 / 25 and Worm Gears Of The Same Power Rating

The *oms* Hypodrive gear units are two stage gear units with a bevel gear input stage and spur gear second (output) stage. The input stage is a highly optimized hypoid bevel gear stage of the GLEASON® type in ground quality. The output stage is an optimized helical spur gear stage, also in ground quality.
The manufacturing technology of the gear toothings are in accordance with the quality requirements of the automobile industry.
The outer dimensions of the gear units and the layout of the motor and the braking unit is similar to those used with standard worm gear units.

Picture 1: EC 2-15
Options: Weaterproof, Short Motor,
Chain Wheel, Brake Function Sensors,
Brake Lininig Wear Sensors

Picture 2: EC 2-25

A comparison between these two types of gear units will be made on the following characteristics, based on the same output power and momentum:

Volume of Gear Unit:

The volume of the *oms*Hypodrive gear unit is more than 30% smaller than a comparable worm gear unit.

Efficiency:

The efficiency of the *oms*Hypodrive gear unit (96 – 97%) is approx. 8% to 10% higher than that of a comparable worm gear unit (85 – 87%) at rated load. That means losses of 3 – 4 % for a *oms*Hypodrive gear unit, versus 13 – 15% for a worm gear unit. At loads smaller than the rated load, the *oms*Hypodrive gear units performs even better compared to a worm gear unit.

Sound Emission:

The sound power level of the *oms*Hypodrive gear unit are well below the allowed sound levels as required by the major manufacturers of escalators and is comparable to well designed worm gear units. This feature is due to the optimized manufacturing technology using the most advanced GLEASON® grinding and measuring technology.

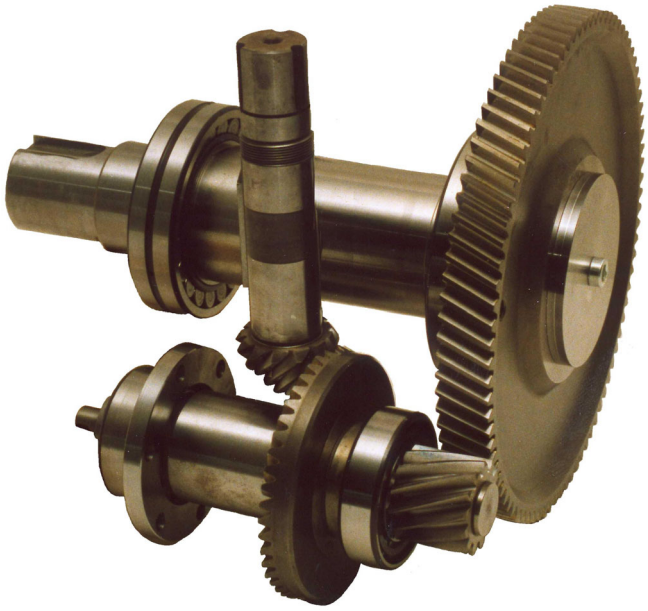
Performance:

The *oms*Hypodrive gear units can be used continously at their maximum output power level for indefinite time, without overheating the gear units. A worm gear unit with comparable reduction ratio should not be used continously at it's maximum power level for more than one hour without an additional external oil cooler.

Wear of Toothing:

The gear toothings of the *oms*Hypodrive gears are calculated for indefinite lifetime and are safe against tooth cracking at rated load. The hardened and ground teeth flanks show a surface smoothing after initial putting into operation, without any abrasion.
For comparison, be reminded that a worm gear unit can only be designed and build with a definite lifetime due to the abrasion of the bronze worm wheel, which is load dependent.

Picture 3: EC 2-7



Picture 4: *oms* Hypodrive Input and Output Stage (Patents pending)

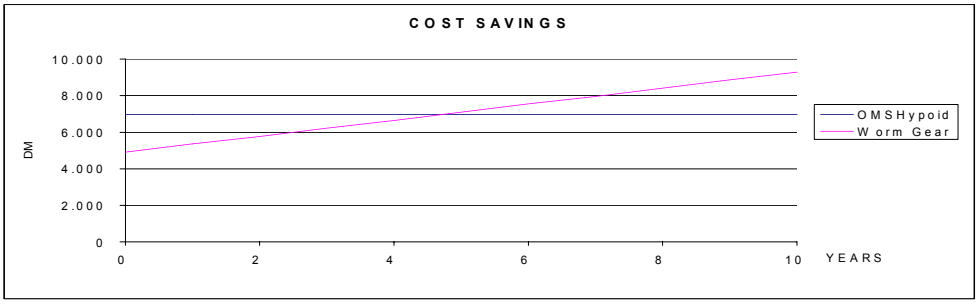
Oil Volumes, Oil Temperatures and Oil Changing Intervalls:

The *oms* Hypodrive gear units use approx. 20% less oil than a comparable worm gear unit. Nevertheless the operating temperatures of the *oms*Hypodrive gear units will be approx. 30K to 35K lower than for a comparable wormgear unit, with the shelf live of the oil in an *oms*Hypodrive gear unit approaching 2x that of a worm gear unit. Due to the much lower heat generated from a *oms*Hypodrive gear unit, the thermal stress for the surrounding materials, electronic equipment, controllers etc. is much less when using an *oms*Hypodrive gear unit as compared to using a worm gear unit. This translates into longer service intervalls for the surrounding equipment, too.

Economical Aspects

Break Even Point:

The comparison of the *oms*Hypodrive and a Worm Gear Drive, both in a commercial application (S6-60%), shows that the efficiency of the hypoid technology is significantly influencing the break even point of the investment. As shown in the diagram below the break even point can be reached after app. 4.5 years - only by the savings of electricity.



Remark: The Difference in the investment of the *oms*Hypodrive and Worm Gear Drive is approximaletly 30%. The additional energy costs of the worm gear drive compared to the *oms*Hypodrive (app. DM 440,- / year) are determining the ascending of the worm gear graph.
Example given is for escalator for commercial applications.

Maintanance:

The maintanance aspect is another cost benefit for the hypoid technology, although it is difficult to quantify according to specific regional conditions.

The *oms*Hypodrive unit needs a check of the oil via the oil level gauge every 10.000 hours (3.6 years). Usually this is the time intervall for a complete oil change for worm gear drives. The recommended oil change intervall for the Hypoid drive unit is 40.000 hours (14.5 years). The change of the oil does not require the removal of the drive unit.

A worm gear drive usually has to be replaced after approximately 70.000 h (25.5 years), due to wear of the worm wheel. The lifetime for the wear resisting *oms*Hypodrive technology is only be limited by the finite lifetime of the bearings.

Conclusion

Due to it's much better efficiency, it's highly optimized gear toohing and ist low thermal output, the *oms*Hypodrive gear units achieve a much higher level of usability as compared to a worm gear unit. The *oms*Hypodrive gear unit will pay itself off within a few years.

Appendix

The comparison of the *oms*Hypodrive and the Worm Gear Drive is based on the following assumptions:

Investment difference between oms Hypodrive and Worm Gear Drive: ***approx. 30%***

Escalator for Commercial Applications (70,000 h lifetime)

Average running time of escalator / day		11 h
Average running time of escalator / year		250 days
Average electricity rate in US $/KWh		0.10
	***oms*Hypodrive**	**Worm Gear Drive**
Efficiency	95%	86%
Nominal power consumption	8 KW	9 KW
Average power consumption (60%)	4.8 KW	5.6 KW
Average power consumption / day	52.8 KWh	61.6 KWh
Average power consumption / year	13,200 KWh	15,400 KWh
Costs / year	US $ 1,320.-	US $ 1,540.-
Savings of electricity / year		**US $ 220.-**
Savings of electricity / lifetime (25.5 a)		**US $ 5,600.-**

Escalator for Public Applications (140,000 h lifetime)

Average running time of escalator / day		20 h
Average running time of escalator / year		365 days
Average electricity rate in US $/KWh		0.10
	***oms*Hypodrive**	**Worm Gear Drive**
Efficiency	95%	86%
Nominal power consumption	15 KW	17 KW
Average power consumption (60%)	9.0 KW	10.2 KW
Average power consumption / day	180 KWh	204 KWh
Average power consumption / year	65,700 KWh	74,460 KWh
Costs / year	US $ 6,570.-	US $ 7,446.-
Savings of electricity / year		**US $ 876.-**
Savings of electricity / lifetime (20 a)		**US $ 17,520.-**