

COMPARISON OF CLARIFIER DRIVES

by

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ABSTRACT

This paper examines the comparative Precision, Metallurgy and Material Rating of gearing offered by Walker Process Equipment and other manufacturers in the water and wastewater industry. Also discusses, with examples, the corrosion resistance of steel, ASTM A536 Gr. 80-60-03 and ASTM A536 Gr.120-90-02.

As a result of a long and sustained program of drive redesigns, Walker Process Equipment/McNish Corporation produces a split ductile iron ANSI/AGMA Class Q6 precision gear with replaceable races that is superior to any drive we know of competing in our market today.

Let's look at this comparative chart of selected attributes for gears:

GEARS

	DUCTILE IRON		STEEL	
	Other Manufactures	WPE Today	Combined Gear/Bearing	Other Manufactures
Precision	Not Claimed	Producer of Class Q6 Precision Gears	Claimed degree of precision not stated	Not Claimed
Metallurgy	ASTM A536 Gr 80-60-03 (or less)	ASTM A536 Gr 120-90-02	Carbon Steel	Carbon Steel
Material Rating	QIT Gr 2 ¹	QIT Gr 1 ¹		

NOTE: Ductile Iron Castings have 2 to 5 times better corrosion resistance than carbon steel.²

¹ Reference: Ductile Iron II, Engineering Design Properties Applications published by Quebec Iron and Titanium

² Reference: Iron Castings Handbook, Figure 7, Page 498; Table III, Page 500. Table IV Page 501, published by The Iron Castings Society, Inc.

PRECISION

As a result of the drive redesign program, Walker Process Equipment/McNish Corporation has changed metallurgy, geometry, dimensioning, and tolerances of its gears which allowed it to obtain a ANSI/AGMA Class Q6 rating. This is a statement of precision.

To maintain our quality rating, Walker Process Equipment adopted a new quality control procedure to meet the requirements of an ANSI/AGMA Class Q6 rating.

The program includes the following elements:

Quality Rating Program

- **From the Foundry**
 - Chemistry and heat treatment certification
 - Tensile test specimen certification
 - Hardness range certification
- **From Walker Process Equipment**
 - Incoming Inspection Verifies:
 - Hardness
 - Casting dimensions
 - Finished Gear Inspection Measures
 - Radial tooth run out
 - Tooth size over pins
 - Tooth spacing

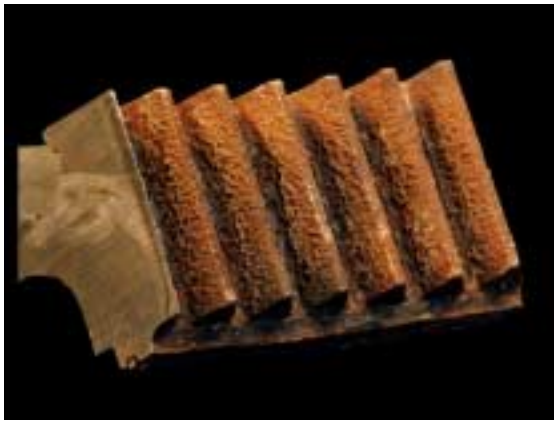
This data is then fed into a program for analysis and a printout is produced displaying the AGMA quality of the gear.

We know of no other gear supplier of internal spur gears with replaceable races that meets these quality standards.

CORROSION RESISTANCE CASE HISTORIES

STEEL GEARS

Walker Process Equipment supplied 12 clarifiers utilizing 80” steel gears that went into operation in 1985. After 13 years we undertook a rehab contract for all 12 gears which were returned to WPE and all were found to be unusable, as you will see in the segment shown in Figure 1.



As Received



Brush-blasted

Figure 1 – Carbon Steel Gears with 13 Years of Service

DUCTILE IRON GEARS

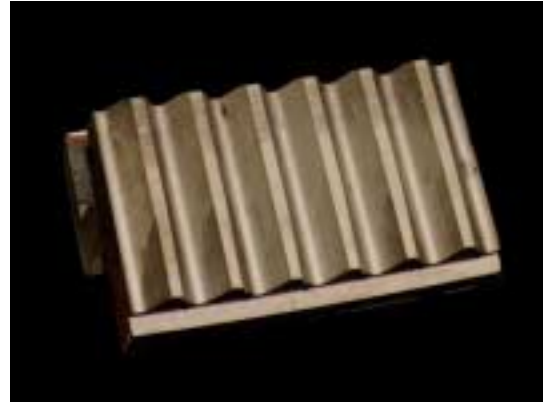
Walker Process Equipment also in the same order supplied four Thickeners utilizing 80” gears made of ASTM A536 Gr. 80-60-03 ductile iron. After the same thirteen years of service two units were returned to WPE for rehab and it was determined that both of the ductile gears were reusable.

The superior corrosion resistance of ductile iron gears is seen in a segment of a used 80 inch gear made of 80-60-03 ductile iron that had 20 years of service at Appleton Paper Co., in Combined Locks, Wisconsin. This gear had been replaced six years ago by the Paper Company even though the corrosion was so slight Walker Process Equipment felt it could be salvaged. As a result, it had twenty years of service in a paper mill and sat out in our yard for the next six years- twenty-six years in total.

Please note the significant lack of corrosion in Figure 2.



As Received



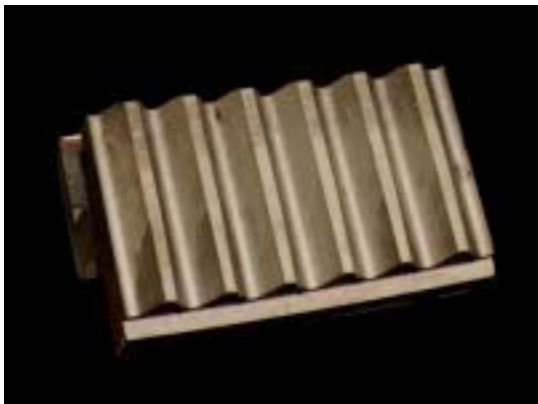
Brush-blasted

Figure 2 – ASTM A536 Gr. 80-60-03 Ductile Iron Gear with 20 years of service.

In the first case history the steel gear showed severe corrosion, which occurred in all 12 steel gears such that none were re-usable, while the 2 ductile iron gears were re-usable. All of these gears had operated in the same environment in the same plant with the same maintenance procedures for the same length of time.

In the second case history the ductile iron gear had 20 years of heavy-duty service, was re-usable, and was stored outside for an additional 6 years.

There is a large disparity in the comparative rates of corrosion as shown in Figure 3. The 80-60-03 ductile iron material clearly provides superior performance.



Ductile Iron (Brush-blasted)



Carbon Steel (Brush-blasted)

Figure 3 – Side by Side Comparison of Ductile Iron Gear and Low Carbon Steel Gear

Since that time, we have upgraded our ductile iron material selection to ASTM A 536 Gr. 120-90-02 as quenched and tempered. This upgrade allowed us to improve our rating from a QIT Grade 2 to QIT Grade 1. For the last few years we have been shipping ductile iron gears with better physicals and an improved corrosion resistance over that of the samples shown.

In summary, Walker Process Equipment/McNish Corporation's AGMA Class Q6 Precision Gear made of 120-90-02 Ductile Iron with replaceable races is superior to any other gear we know in that it combines both superior precision and superior corrosion resistance.

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For More Information

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