Improving Compressor Efficiency through Motor Conversion

By

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Statement of the Issue

Many pneumatic conveying compressors were installed “years ago” during original cement plant construction or expansion.

Using equipment available at the time, the compressors were driven by low-RPM motors and direct coupled.

By present standards these compressor systems are inefficient energy hogs.

Original: Direct Drive with Low-RPM Motor

Disadvantage of Original Supply

1. **Original Supply 1950s – 1970s**

2. **Original Design = Direct-Coupled Drive**
   - **V-Belt Drives less Reliable**
   - **Cog-Belt Drives were not Available**

3. **Now "Non-Standard" Low Speed Motor**
   - **590 or 705 RPM**
   - **Very costly to Replace**
   - **Long Delivery Time**

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What Changed since Original??

1. Motor Standardization

- Most Common RPM = 1800
- Standard Costs driven down
- NEMA Premium – 2001 (current standard)
- Efficiency of 92% or more

2. Cog-Belt Drive Perfected

- 400 HP+ with one (1) Synchronous Belt
- Reliability greatly improved
- Cost Reduced

How can Efficiency be Improved?

1. **Purchase Motor to Modern Standards**
   - **NEMA premium**
   - **1800 RPM**
2. **Cog-Belt Drive**
3. **Conversion frame with guards**
4. **Footprint of former motor**

Reduce Power Consumption with a High Efficiency Upgrade

Items Needed to Convert

1. **Motor information**
   - **NEMA premium efficiency**
   - **1800 RPM**
2. **Cog-Belt Drive**
3. **Conversion frame with guards**
4. **Footprint Details of former motor**

Motor Conversion

New 1800 RPM Cog-Belt Drive

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Installation Results

	Original Motor	*Replacement*
RPM	590	1800
Average kW over 24 hours	181 kW	116 kW
Average production in tph	63.8 tph	67.0 tph
Average kW/ Ton	2.84 kW / ton	1.74 kW/ton
Cost per kWh	6.5 cents	
Annual average run hours	7756 hours	
Annual energy costs	USD 84,436.40	USD 31,189.30

Data courtesy of CalPortland Cement, based on a 2013 study.

Conclusions

- **Achieved 48% energy cost savings**
- **Conversion cost payback was achieved in less than one year**
- **The plant received EnergyStar designation**
- **Many additional conversions have been completed**

“Piggyback” Alternative

Compressors designed for Top-Mount Motors are Available

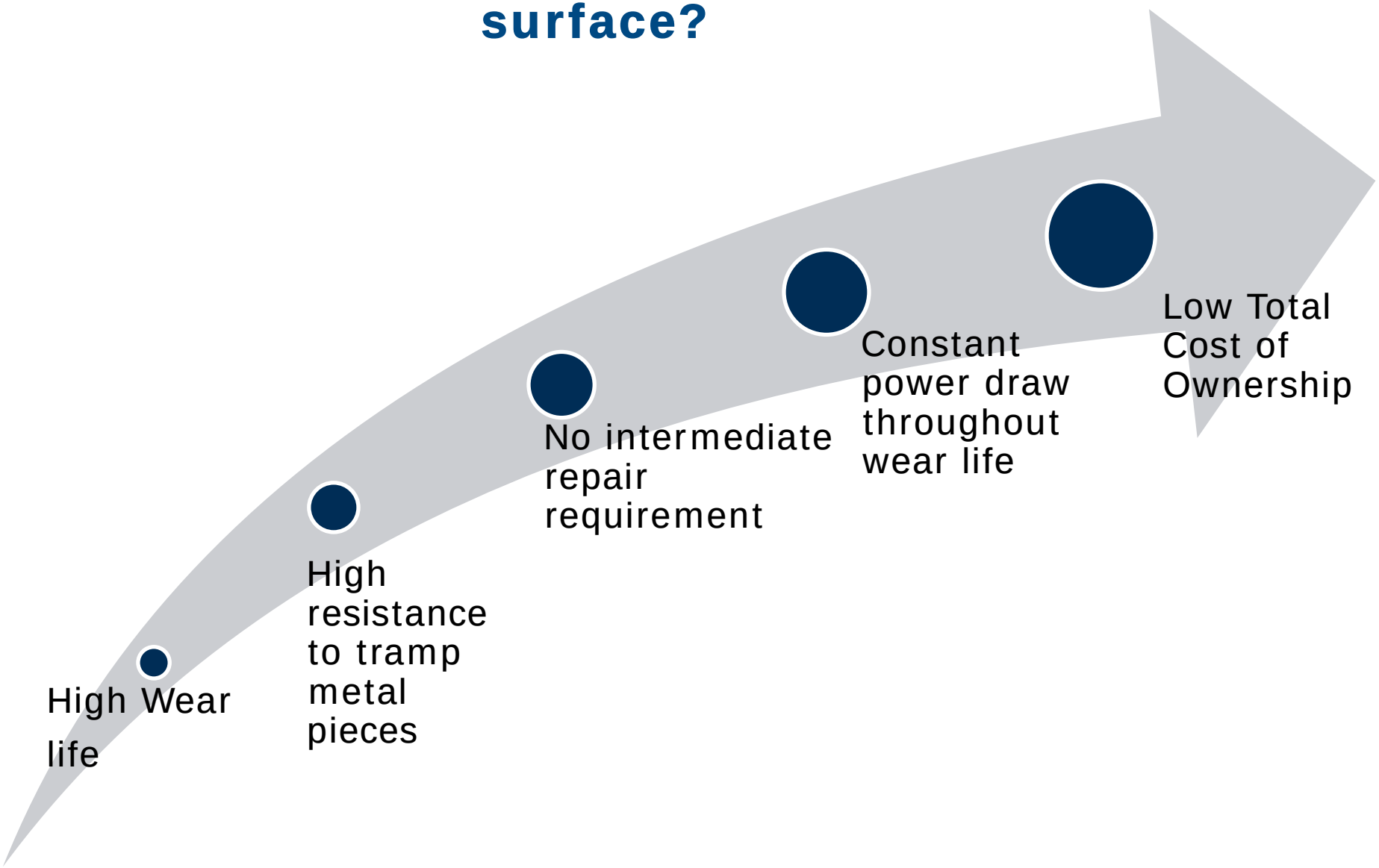
Existing Compressors can be Exchanged for New or Recon Compressors

A new High-Efficiency, 1800 RPM Motor and Drive is all that is needed for the Power-Saving Conversion

Preview for Next MTC Meeting

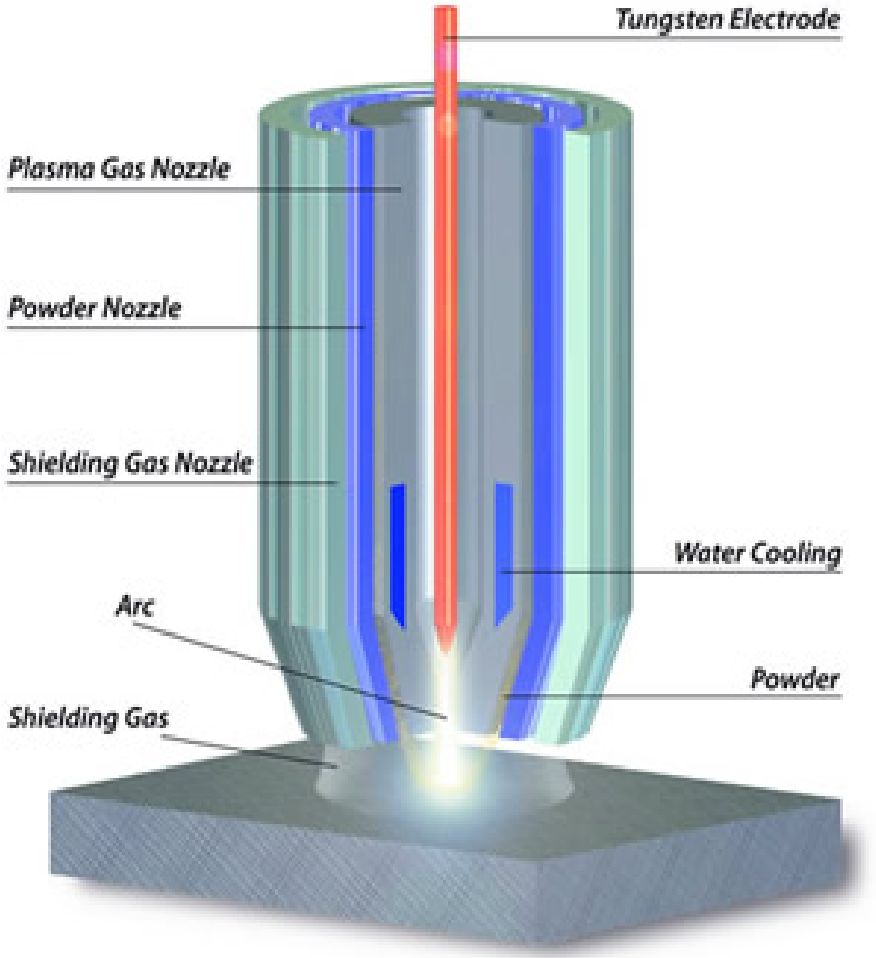
FLSmidth TRIBOMAX® Wear Surface

What do we expect from a good wear surface?



Introduction to TRIBOMAX® Wear Surface

- Low heat input. Almost crack-free
- Steep textures, multilayers
- Developed and patented by FLSmidth
- Tailor-made powders for the application
- Guaranteed lifetime of minimum 25 000 hrs
- Low total cost of ownership
  - high wear life
  - no intermediate repair



TRIBOMAX® surface concept

The TRIBOMAX® surface has a built-in roughness and offers a constant torque factor throughout the lifetime

Tribomax® does not require a pattern or profile on the outer surface. Hence limited or no repair

The TRIBOMAX® surface makes an autogenous wear layer that adds to improve lifetime further.