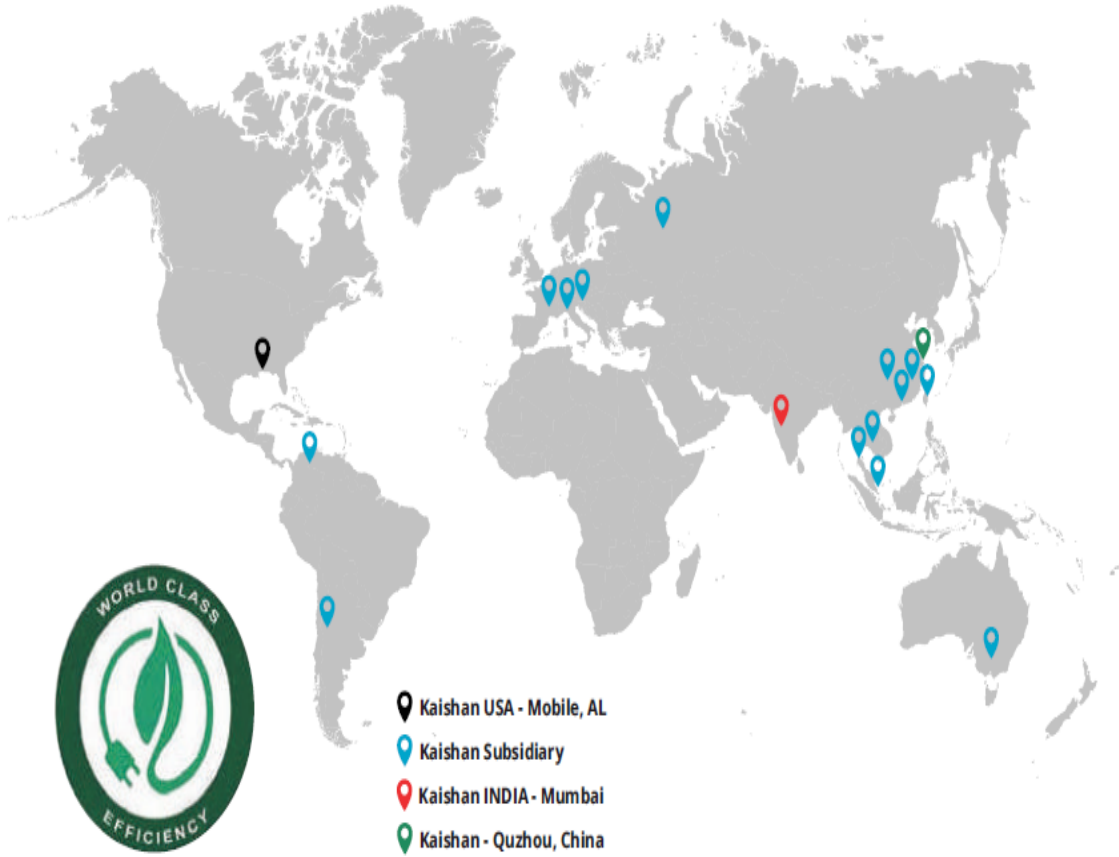
Best Practices in Energy Efficiency & Decarbonization in cement sector

Low Pressure Compressors for energy efficiency in bulker unloading/ flyash conveying process

14th March 2023

Who is Kaishan

- More than 60 years in Business.
- 3rd Largest Compressor Manufacturer in the world.
- Engineering based company with large R & D investments.
- 32 manufacturing Plant in the World
- Manufactures over 1,00,000/- screw compressor and 2,50,000/- Reciprocating compressor
- The R & D center and core management organization are in USA
- Kaishan's manufacturing processes are 85% vertically integrated insuring full control of the material supply chain which includes Airends, castings, enclosure tanks coolers frames etc.
- 4 Billion Asset Value
- **Human Resources** ·6495 employees： 3000 professional technicians ·360 oversea employees



Organizational Structure of - 73 companies +

KAISHAN Global Manufactures and R&D

- **Seattle**： Kaishan R&D center of US The top compressor and fluid R&D Center
- **Europe Vienna & Wuxi**： LMF： The advanced manufacturing and R&D center based on high pressure reciprocating and axial flow technology
- **Melbourne : Kaishan Australia** Company Oceania, manufacturing and marketing base
- **Taizhong**： Taiwan Kaishan compressor Company Manufacturing and Sales Center
- **USA：** Kaishan American Plant The important R & D and sales center in North America

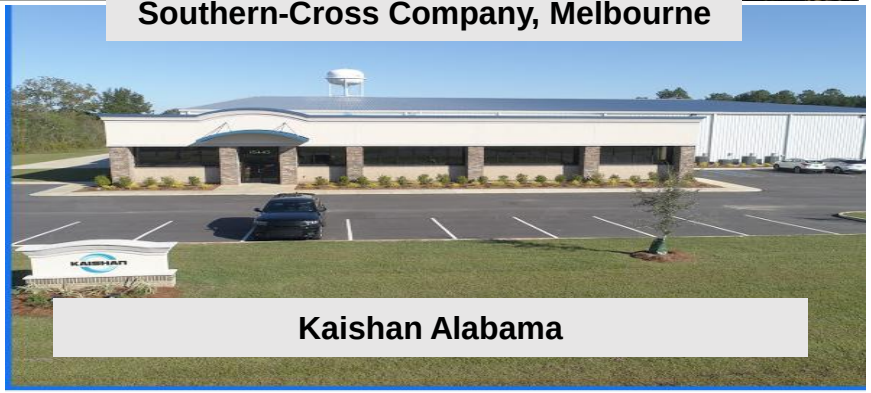
Kaishan North-American R&D Center, Seattle. USA

LMF Industrial Park, Vienna

Kaishan Europe

Southern-Cross Company, Melbourne

Taiwan Kaishan Compressor Company, Taizhong

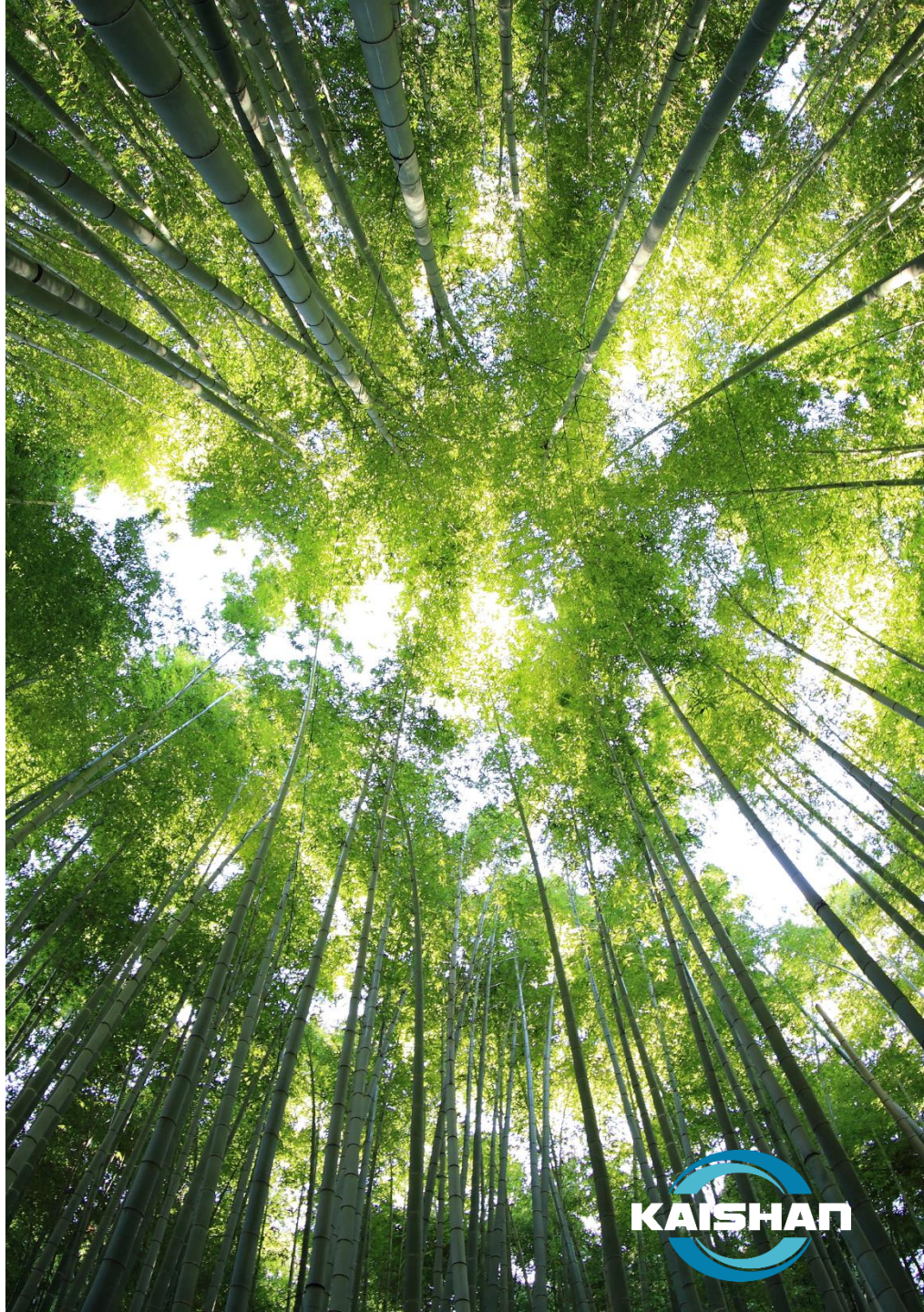


Kaishan Alabama

Kaishan’s Sustainability Goal

Reach Net Carbon Neutrality

- Produce enough renewable energy from our geothermal and waste energy recovery power plants to offset the energy consumed by all the compressors we manufacture. This is a bold goal as Kaishan manufactures 1,00,000 compressors annually.
- Kaishan’s ORC (Organic Rankin Cycle) and steam screw expanders utilize the same core technology as in our rotary screw air compressor products.
- Currently Kaishan operates energy recovery plants around the world with 300MW online – several more projects in the works.



Product Offering

KAISHAN

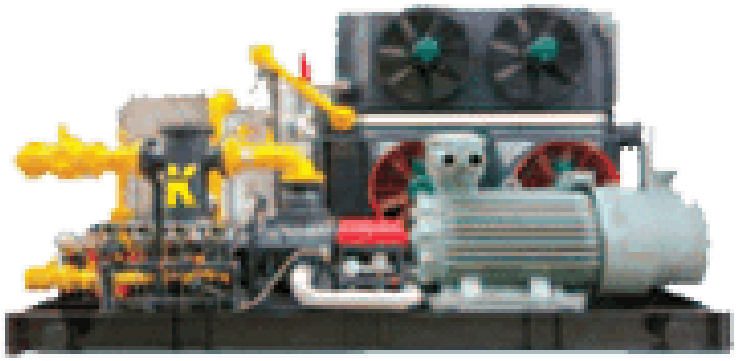
Compressor Offering

Lubricated Screw Compressor

Oil Free Screw Compressor

Vacuum Pump

Portable Screw Compressor



Gas Compressor

Refrigeration Screw Compressor

Compressor Offering

Water Injected Screw Compressor

Scroll Compressor

Centrifugal Compressor

Reciprocating Compressor

Screw Blowers

Refrigeration Air Dryer

Power Generation Offering

Geothermal Power Generation

Biomass Power Generation

Industry Waste Pressure Power Generation

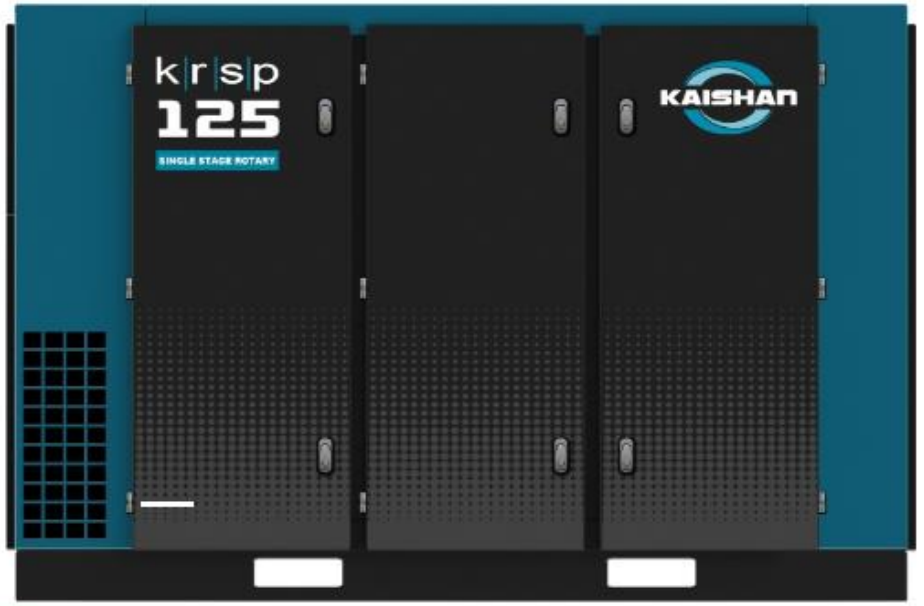
Industry Waste Heat Power Generation

Low Pressure Compressors (2 to 3 bar)

Planning Energy Saving?

First, get an air audit. If you don't, you are rewriting a prescription without proper diagnosis.

And that's malpractice!



How do I improve my Compressed Air System

- Don’t panic. It’s easier than you think!

1. Complete a CAC (compressed air challenge) system audit

- You can’t manage what you don’t measure!

2. Data log for one or two weeks and find out what’s really going on

- Audit the supply side (compressed air system) as a minimum for “low hanging fruit”
- Audit the demand side (plant equipment) as an option for a more in depth look at how your compressed air is utilized

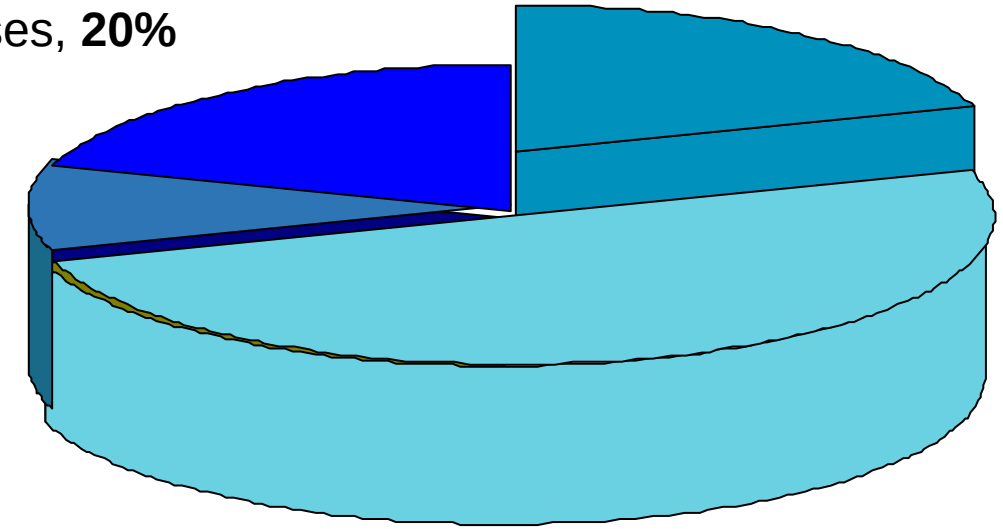
Compressed Air Utilisation In A Conventional System

Increase Compressor Pressure to overcome pressure drop in the system & Air Leakages

Excess Air than Required

System Losses, **20%**

Artificial Demand, **20%**



Poor Practices, **10%**

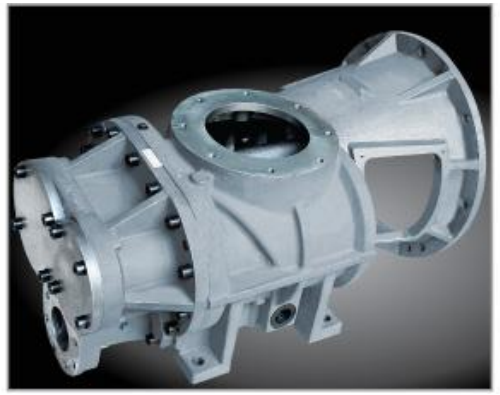
Using Air at 7 bar for cleaning; Draining of Condensate Water together with Air at 7 bar

Production, **50%**

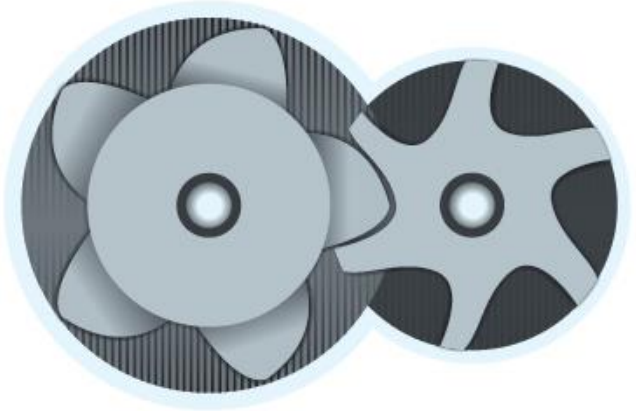
Only 50% of compressed air is utilized

Source: CAGI

KAISHAN LOW PRESSURE DESIGN BENEFITS



- ✓ Super Efficient 5 : 6 Screw Profile
- ✓ Unique design, no Gears, no loss on transmission
- ✓ Lowest pressure ratio leads to reduce Thrust force stress of each component
- ✓ Minimum internal leakage



- ✓ 1:1 Direct Drive
- ✓ Optimal performance at 2~5Bar by the Patented design of SKY element
- ✓ Triplex Bearing Design

KAISHAN LOW PRESSURE DESIGN BENEFITS

- ✓ Independent oil pump to secure the lubrications
- ✓ larger oil and **after cooler** ensuring air quality
- ✓ Bigger Size Separator Tank
- ✓ Sufficient cooling flow to protect machine out from trouble
- ✓ Carry over will be limited 2 – 3 ppm as against 5 – 6 ppm at 3.5 bar
- ✓ With help of Mechanical pump we can go to a pressure as low as 1.8 bar in the offered compressor

CASE STUDY

Chettinad Cement, Kallur works

KAISHAN

BEFORE

High Pressure

Screw Compressor

Air flow required for Fly-ash unloading : 750CFM @ 2bar

OLD Compressor Details

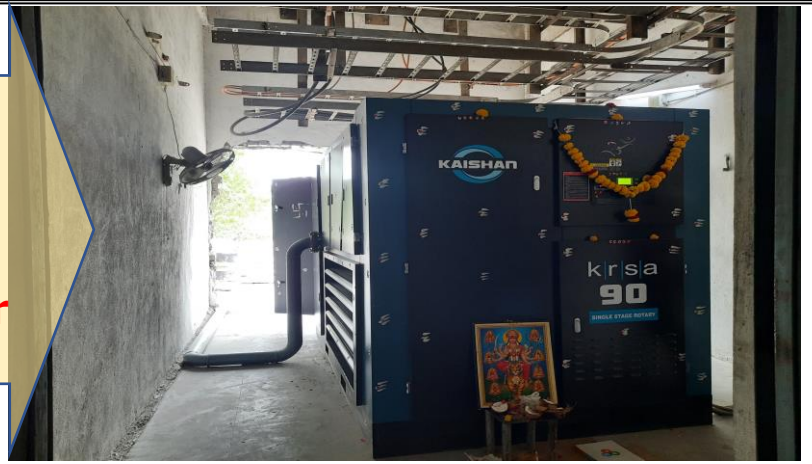
160kW @ 7.0 bar – Full load

Operating Pressure	: 5.5 bar
Max. Power of 160kW	: 157 kWh
Specific Power	: 0.157 kW/CFM ……. (a)
Running Hours/Year	*: 3630 HRS*
Energy Cost/unit	*: INR 7*

AFTER

KAISHAN

LOW Pressure Screw Compressor



NEW Compressor Details (Kaishan Low Pressure Series)

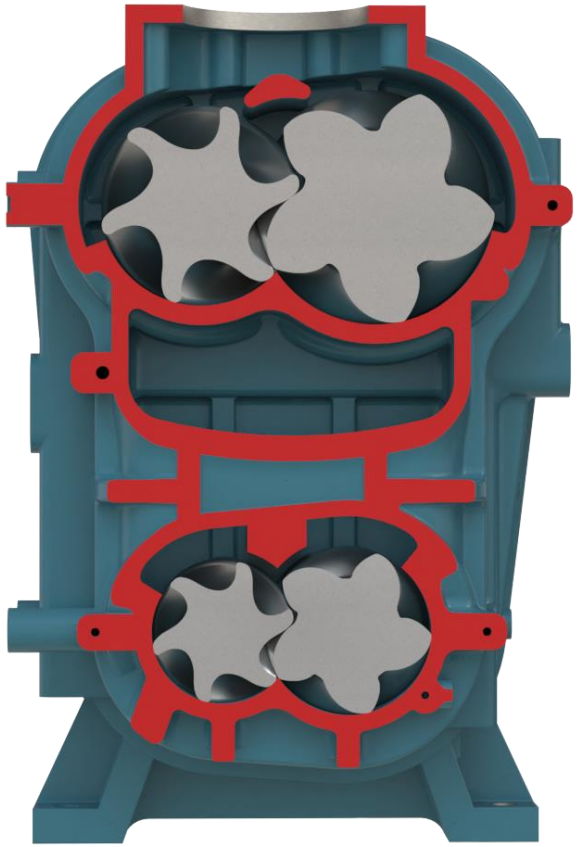
90kW @ 3.0 bar (KRSA90-3)– Full load

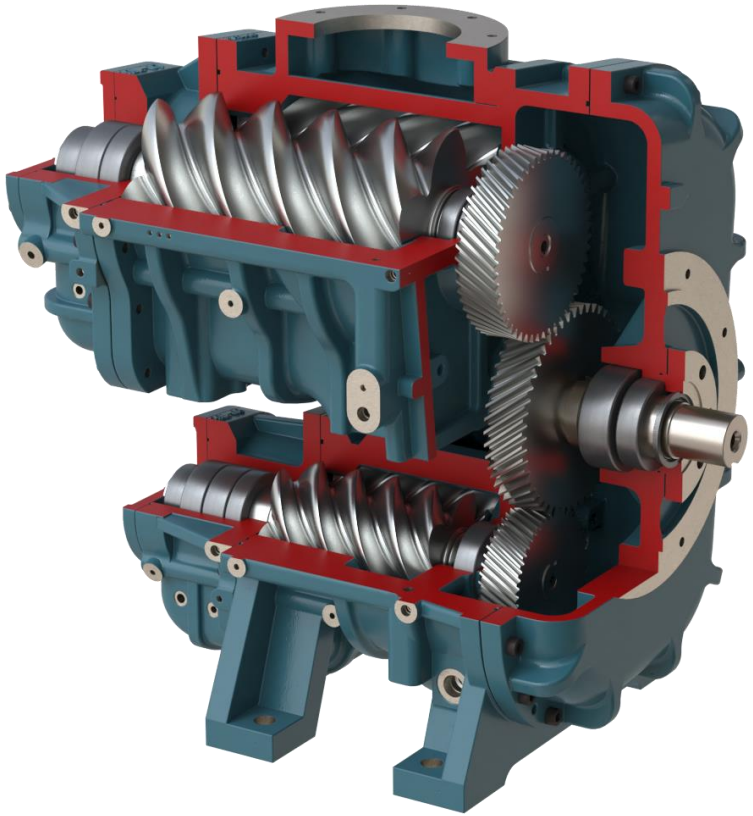
KRSA90-3 generating 898 CFM @ 3 bar has reduced the Bulker Unloading time & Total Power Consumption.

Max. Power of KRSA90-3	: 83.16 kWh
Specific Power	: 0.093 kW/CFM ……. (b)
Specific Power Diff. (a-b)	: 0.064 kW/CFM
Energy saving/Year	: 2,08,554 kWh

47 % Energy Saving achieved with KAISHAN Compressor

Two Stage Compressor





- Compression Ratio divided in two Stage hence Load is divided in Two Stage.
- High Reliability due to Low rpm.
- 8 to 10% power savings over Single stage screw compressor
- Available for pressure requirement of 5 bar & higher

References

Ultratech	Adani Cement	Shree Cement	Chettinad
Bela	Ametha	Beawar	Kallur
Maihar	Kymore	Purulia	Ariyalur
Siddhi	Lakheri	Gulbarga	Karur
Bhatinda	Bhatinda	Saraikela	Karikali
Awarpur	Rabriyawas	Nawalgarh	Vizag
Dalla	Maratha		
Wanakbori			

Dalmia, Ramco, Myhome, Wonder, Shriram

ENGINEERING THE FUTURE