



11 Beryllium Street, Alrode Extension 14, Alberton, 1449

P.O. Box 167173, Brackendowns, 1454

TEL: 011 908 4169  
 FAX: 011 864 1588  
 SMS: 083 703 1291

Email: [info@are.co.za](mailto:info@are.co.za)  
 Web: [www.are.co.za](http://www.are.co.za)



## ARTHUR RUSHMER ENGINEERING ENT CC (A.R.E.) - COMPANY PROFILE

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### INTRODUCTION TO A.R.E.

	<p>Arthur Rushmer Engineering Ent. cc, (ARE) was established in 1997 and is a major player in the modern compressor market. The organisation maintains Utility Aircontracts, Rental Services &amp; exclusively provides services on all Mattei Rotary Vane Compressors supplied through the organization.</p> <p>We became part of the ISO 9001:2000 family in April 2008 certified by Lloyd's Register Quality Assurance.</p> <p><a href="http://www.are.co.za">www.are.co.za</a></p>
	<p>Our subsidiary, Air Bank Corporation (ABC), was established for the purpose of managing:</p> <ul style="list-style-type: none"> <li>• Utility Aircontract Agreements</li> <li>• Aircontracts</li> <li>• Rental Agreements</li> </ul> <p>and includes full servicing facilities, condition monitoring systems and maintenance plans in accordance with the ART quality management system.</p> <p><a href="http://www.airbankcorp.co.za">www.airbankcorp.co.za</a></p>
	<p>Compressed Air Aluminium Smelter Team, CAAST, is a division of A.R.E. that specialises in products and services, specifically for the Aluminium Smelting Industry. Although A.R.E. has been involved with various smelters locally and abroad, the CAAST team has been formed in order to carry out and monitor current services as well as develop, improve and prototype Aluminium Smelter compressed air equipment and requirements.</p>

ARE has a full range of products to offer, in both the Compressed Air & Power Generation markets.





ARE focuses on the Mattei Brand of Rotary Vane Compressors and are able to supply, install & maintain products ranging from small standalone compressors to large compressed air networking, management & monitoring solutions.

We have sole distribution of Mattei Rotary Vane Compressors in Southern Africa.

ARE runs on state of the art technology and its accredited Quality system for its basic day to day, back office and customer focused solutions:

- ART System (Arthur Rushmer Toolbox) – is a Full Online ISO 9001:2000 System
- Customer Relationship Management (CRM)
- Microsoft SharePoint Services
- Document Management Solutions
- Full Network Remote Access and Monitoring
- DIG ITC 2008 (Digital Image Gallery - Information Technology Compliance)

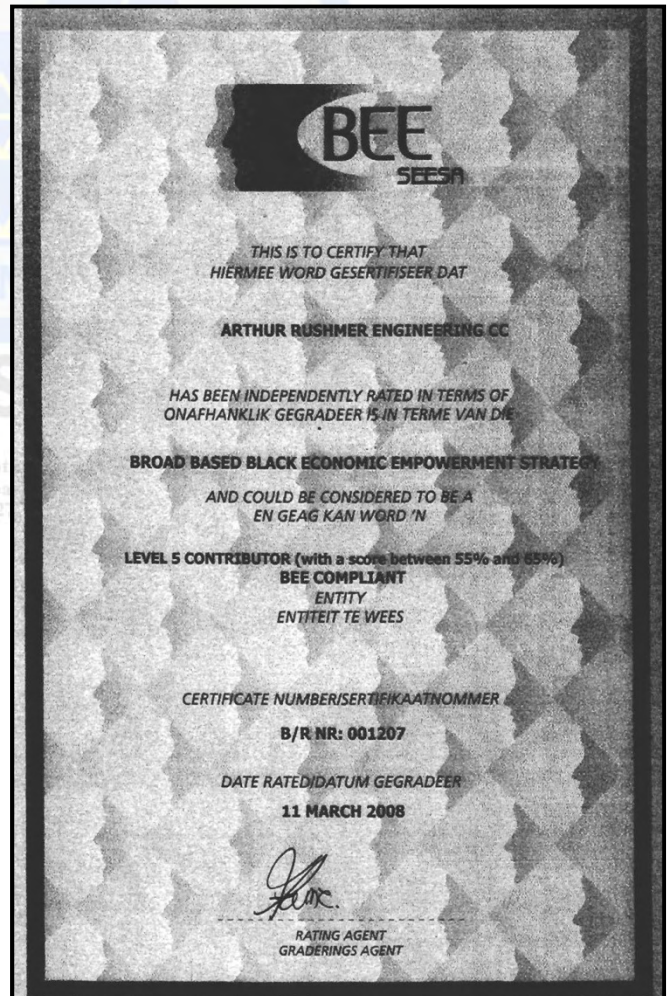
#### A.R.E. CUSTOMER INFORMATION - REFERENCE

	BHP Billiton	Since 2000
	De Beers	Since 1997
	Harmony Gold	Since 2003
	Eskom Group	Since 2004

#### ISO 9001-2000 CERTIFICATION



#### BEE - LEVEL 5 CERTIFICATION



**COMPANY PROFILE**



The Organisation is involved in the Supply & Design of Air Compressors, Generators, Blowers and Servicing.

The product range and servicing of the Organisation includes the following:

- Standard Electric Driven Air Compressors
- Custom Built Electric Air Compressors
- Blowers
- Air Treatment Equipment (Dryers & Filtration)
- Generator Sets (Standard or Custom Built)
- Repair of Compressors, Generators and Dryers
- In House training of equipment and personnel

Additionally:

The administration and management staff embraces all of the organisation  
 For the purpose of the day to day administration, the staff compliment embraces the entire organisation under one system  
 We are an ISO 9001:2000 Organisation, Certified by Lloyds Register

**COMPANY POLICY**



As the Managing Director of the organisation I am committed to the Implementation of one umbrella Quality Management System (which complies with the Recommendation of ISO 9001:2000 for all of the organisation.

We clearly understand the vital role played by quality in supporting the business objective of this organisation exemplifying the concept of "doing it right first time" in an atmosphere of honesty, integrity and trust. We will therefore ensure that the Quality Management System, its spirit and intent is communicated, implemented, and maintained by employees throughout the organisation leading to the ongoing benefit of all stakeholders.

The Organisation will achieve this policy through:

- Recognition as a totally reliable and consistent supplier in all our related products.
- Ensuring that our operational costs are minimised through the effective application of Quality Management principles and systems.
- Minimising all forms of wastage through planned systematic control of all our activities.
- Providing agreed quality and service levels, by fully undertaking our customer's needs and requirements and having the capability to meet them.
- Introducing and maintaining ongoing quality education and training for all our employees to develop individual skills and to increase Quality Awareness.
- Review our Quality Objectives on an ongoing basis.
- Improved Communication and self discipline.

**QUALITY OBJECTIVES**



- Meet Delivery Dates > 85%
- Customer Satisfaction > 95%
- Warranty Claims < 3 per Month
- Warranty Claim Costs < 0,05% of Turnover

To provide Products and Services to our Customers, which Conform to Agreed Requirements, Including Product Performance, Delivery Time and Cost.

To meet Customer and Internal Requirements the First Time, Every Time.

To provide Customers with the Confidence that they will be Supplied with High Quality Products and Services Consistently.

To have a Complete Quality Related History available for each Product and Process.

To Achieve and Maintain the aforementioned, the Organisation has Adopted a Policy of Quality Assurance.

## INTERNATIONALLY BASED - ALUMINIUM SMELTER SERVICES AND OPERATIONS

### THE OPPORTUNITY:

A.R.E./CAAST division is in the process of establishing an operation in Australia, initially focused on global services to all the Aluminum smelters in the southern hemisphere and the Middle east and eventually marketing and building the Mattei Rotary vane compressor brand which is literally unknown in Australasia.

### RATIONALE:

A.R.E. have gained substantial experience in services and aftermarket support on the Mattei brand of compressors that are exclusively supplied to the Aluminum Industry through ECL International in Africa, Australia and the Middle East. The Australian market displays similar characteristics to our known market. We believe that we have sufficient skill, resources and tenacity to offer exclusive services and training on all aspects of compressed air requirements of the PTA cranes fitted with the Mattei brand of compressors supplied by ECL to the Smelter Industries globally and most successfully.

The A.R.E /CAAST Australian Office will be a duplication of South Africa and will incorporate **ART (Arthur Rushmer Toolbox)** and ISO 9001/2000 with Lloyds Register Accreditation and Microsoft Sharepoint services, all state-of-the-art technologies & a systems manager that will run its basic day to day, back office and customer focused solutions globally:

- **Customer Relationship Management (CRM)**
- **Microsoft SharePoint Services**
- **Document Management Solutions**
- **Full Network and Integration between Australian & South African Offices**
- **DIG ITC 2008 (Digital Image Gallery - Information Technology Compliance) connected via ARE Intranet**

A.R.E./CAAST Australia will also host the Australian & International Websites for marketing and advertising purposes and information resources for customers and staff.

The Australian business venture will initially be funded by the existing South African operation. Revenue will be generated from the sale of new equipment and supporting existing Mattei equipment in the Australian market (supplied by Compair who were previously the agents for Mattei) mainly through offering maintenance contract solutions and the supply of original spares on Mattei equipment already existent in the Australasian Market but currently identified as Compair products.

A.R.E. will introduce innovative financing solutions for products to the Australian market in order to boost sales and acquire maintenance contracts. Our proven Aircontract solutions already proven in the South African market successfully is based on A.R.E. experience gathered over the last 11 years, especially in Air Contracting & more recently the supply of Utility Air (over the last 4 years) through its finance and contracts division, Air Bank Corporation.

### STRENGTHS: (CAAST – Compressed Air Aluminium Smelter Team, a Division of A.R.E.)

CAAST has expertise in Smelters that are within the Southern Hemispherical and Middle east conditions, where the air compressor environment can be arduous and ambient temperatures can be as high as 65°C in the PTA crane girder at times. CAAST has more than 50 years experience in Rotary Vane Technology which has proven to be the most successful technology in the smelter environments and are the sole compressors supplied by ECL incorporating Pechiney technology. CAAST also has expertise in air treatment and environments with high relative humidity and requiring sophisticated in-line air filtration, a vital requirement in Aluminum smelter environment to save money on the PTA crane maintenance. CAAST has produced a reputable range of Pressure Swing Air Driers built in SA and technically upgraded for the PTA cranes.

### OPPORTUNITIES:

The Australian Market is unaware of Mattei Compressors as a unique product. They are virtually unknown down-under and are considered to be CompAir products in most parts of the country. At the Boyne Aluminium Smelter, for instance, CompAir are representing themselves as the manufacturer of the compressors under the Hydrovane brand and not identifying the product as Mattei. CAAST will build the Mattei brand in this space in conjunction with the crane manufacturer as the best solution in compressed air requirements.

Entering the Australasian market while GD-CompAir are still re-strategising their market after the international buyout of Compair during 2008. This is the most opportune time to gain Mattei brand recognition and market share. The Initiation of spares supply contracts, service exchange programs and maintenance operator training to the Aluminium smelter Industry is a good starting point for ARE/CAAST to enter that market with the Mattei Product and Technology which will be supported by ARE and indirectly by the original manufacturer of the PTA compressor – Ing Enea Mattei SPA of Italy .

There is currently a global shortage of specialists in the field of Rotary Vane Compressed Air Engineering. A.R.E./CAAST understand this technology and will focus on transforming the market on the advantage of rotary vane technology incorporating VSD (variable speed drives), which has only recently been recognized as the most adept technology for inverter controlled compressors that will become the leading energy saving device in compressors in the very near future.

**PRODUCTS AND SERVICES:**

- MATTEI Rotary Vane Compressors & Original Spares kits
- MATTEI PTA Compressor Custom Designed Pressure Swing Desiccant Driers
- CAAST Filtration & Drainage on Compressor & Driers
- MATTEI PTA Compressor, Drier & Filtration Training
- Long term service exchange programs

**SPECIALISED PRODUCT ENHANCEMENTS:**

- ISO 8573 Class 1, 2 or 3 Air out to PTA systems
- Energy Saving Enhancements and Modifications
- Compressor and System Cooling Enhancements
- Accurate External Site Glass Kits
- Air Intake Modification and Upgrade Kits
- Specialised Lubrication for Rotary Vane Compressors within Aluminium Smelter Plant Environments

**RESOURCE ALLOCATION:***PERSONNEL*

A Dedicated Team of Qualified Specialists to cover Africa, Australia & UAE

*FINANCES*

Based on Capital Requirements, A.R.E. South Africa is committed to apply the necessary resources

*DISTRIBUTION*

This will initially take place through A.R.E. South Africa's existing facilities until the business can justify a spares holding facility

*PRODUCTS*

Mattei Rotary Vane Compressors, CAAST Pressure Swing (activated alumina) Driers, SPX-Deltech Filtration Equipment

*SERVICES*

Unit Exchange Program, mandatory service & emergency break down stock items

**MARKETING STRATEGY:**

To offer global Aluminium Smelter technical & marketing services, based on the history and reputation of A.R.E. South Africa and current dealings with African and International Aluminium Smelters.

We are registered vendors at the following Smelters:

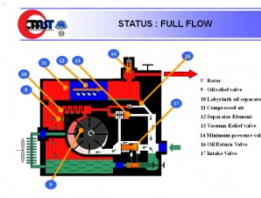
Hillside Aluminium	South Africa
Mozal Aluminium	Mozambique
Alba Smelter	UAE
Bahrain Aluminium	UAE
Boyne Aluminium	Australia

**GENERAL – A.R.E. DATABASE & INFORMATION LIBRARIES:**

A.R.E.'s Online Quality Management System, Intranet, SharePoint Extranet, Customer Relationship Database and Document Management System contain decades of indexed and easily accessible information all geared towards our standard and specialised products and services in the Aluminium smelter Industry.

**GENERAL – ALUMINIUM SMELTER TRAINING:**

Although A.R.E. has a fully interactive based training centre and facilities, we regularly provide on-site training to the Aluminium Smelter industry. Utilising on-site experience, manufacturer recommendations as well as CAAST specialised information, complete and practical training can be provided for all aspects of compressed air maintenance within the aluminium smelter environment. Written tests are included in the training agendas. These include the marking of the individual tests, full reporting and certification for Human Resource departments as well as overall percentages and improvements from previous results.



**CURRENT SERVICES AND PROTOTYPE DEVELOPMENT OF PRODUCTS FOR THE PTA AIR TREATMENT:**

REDUCTION SERVICES  
Pot room Maintenance

**FACTORY ACCEPTANCE TEST REPORT**

ATTENTION		FROM	
Name :	Josue Siguaque	Name :	Jan Van Rooyen
Copies to :	Aurelio Manjate Nick Thorpe Victor Mambo Mahomed Adam Shift Supervisors	Date :	9 December 2008
		Ref:	PTA Compressor Air Drier Test

**Report on visit to Arthur Rushmer Engineering, Alberton by Mozal.****INTRODUCTION**

We are currently experiencing multiple breakdowns on the Shovel Quick Close Valves, Bath Hoppers that do not want to drain, MLLB Ejectors Blocking, MLLB Exhausts blocking, MLLB not tapping properly, blocked Tapping Tubes and abnormal amount of water in the Anode Raising Beam water traps e.t.c. The list just goes on. It was found that in all the cases the PTA Air Driers were either blocked or bypassed. The desiccant inside the Driers gets contaminated, causing high pressure drops across them. ARE (Mattei SA) assisted us analysing the current Compressed Air Filtration and Driers system. The pre-filtration and drier capacity was found to be inadequate for our conditions. They have designed and built a pilot system suitable for our climate. This system was ready for test with one of our refurbished Compressors before it was to be returned to MOZAL.

**PURPOSE**

The purpose of the exercise was to evaluate and witness the performance of the new proposes Air Drier System. The test was done on Tuesday, 9 December 2008 at ARE's factory in Alberton. Victor Mambo and Jan Van Rooyen represented MOZAL at the test.

**FINDING**

- The new filtration system was draining condensate at a tempo of 1 litre every 5 minutes at a flow of 409cfm. The ambient was 28°C and the relative humidity was 67% during the test.
- The air dryness went down to a dew point of -56°C with a purge pressure of 4bar
- A constant dryness of DP -26°C was reached with a purge pressure of on 1,7bar.
- The Mattei test nozzle was installed after the Drier/Filter combination and compressor still maintained a 6bar delivery pressure.
- The Power saving system was disconnected as the compressor was not able to take advantage of it. The constant purging of the drier caused the Compressor not to reach Power saving state. The system caused unnecessary strain on the Minimum Pressure Valve. This created abnormal wear on the Valve Seal and spring.

**DISCUSSION**

The Filter/Drier system performed flawlessly. The Drier's component layout was very cleverly done! All the serviceable components were brought forward. This makes the new unit very Maintenance friendly. We have requested ARE to make provision for a signal from the PTA Control System which will prevent the Drier to purge during Tapping. The Compressor's delivery is such that any extra air usage during tapping will impede on the MLLB Ejector performance. We have also requested them to re-route the Purge Valve copper air supply line. The current design is protruding in the front and leads itself to easy damage.

**KEY LEARNINGS**

- The current Air Filtration/drier system leaves a lot to be desired.
- We are wasting lot of energy unnecessarily with the current setup. The original Power Saving idea of decreasing the Compressors internal pressure during the unload period is not practical in this application. Other ways of saving power needs to be explored.
- The current Compressor setup allows for no margin of inefficiency. There is no extra capacity to make up for any leaks, pressure drops, blocked or dirty Ejectors. The Compressor's Capacity is stretched to the limit.
- Any Desiccant Air Drier requires dry air to purge the vessels. Our current Compressor can barely supply enough air for the Tapping Process. Purging needs to stop during Tapping. Ways and means needs to be explored to increase the Compressor's output volume.

## **RECOMMENDATIONS**

- It is recommended that the new Drier system is installed for test purposes. ARE has agreed to build and supply the first unit on their cost. Payment for this is then only due after the system has proved itself to be efficient and cost effective. They have also proposed a buyback scheme for the old PTA Air Driers on an exchange basis.
- By installing the new type air filter/drier system, the following direct savings can be realised;
  1. Desiccant change out frequency will be extended from Yearly to 5-Yearly. The current cost is 6000 USD per year per PTA. The potential savings is \$4800 per PTA per year.
  2. Bekomat condensate valves will not be used anymore. The current cost is \$4141 per PTA Per year.
- The current Compressor system is running for 90% of it's time at a semi-unload state, still consuming 70kW Power. It is strongly recommended that MOZAL change one System and install a Variable Speed Drive for the Compressor Motor. This will have the following advantages;
  1. The compressors output can be controlled from 285 CFM to 485 CFM. This will give us the advantage of saving power in the unload phase as well as a whopping 20% increase in volume during Tapping! The current capacity is maximum 409 cfm. The actual power saving can only be determined once the system is up and running. Savings of up to 40% is possible.
  2. Compressor life will be extended as the unit will run cooler. The oil as well the separators will last longer by running at lower volume for the most of the time.
  3. Maintenance cost will be less due the factors above. Mechanical shocks on the drive coupling and pins are also eliminated because the Motor starts up and shuts down at a predetermined speed ramp, eliminating any sudden mechanical shocks.

## **CONCLUSION**

The new type Filter/driers system performed above expectations. The trip was worth it as we had the opportunity to simulate different operating conditions. This has lead to the decision to abort any further development of the Power Saving Air-end. It has also confirmed the fact that the current Compressor Arrangement is barely making the required delivery volume. It has zero extra volume delivery capacity, causing tremendous problems during Tapping in the Potrooms. The slightest air leak can not be compensated for. We can overcome the need for installing a new type compressor with a higher output volume by installing a variable speed drive for the drive motor. This option needs to be explored further.

## **PHOTOS**



### COMPRESSOR SERVICE EXCHANGE PROGRAM:

Arthur Rushmer Engineering has been running compressor service exchange programs with Hillside and Mozal Aluminium Smelters for the past 5 years. The main purpose of instituting the exchange program and replacing the Mattei C450 Air Ends at  $\pm 50\,000$  hour intervals is to eliminate the liability of holding stock required to carry out major overhauls. Also to streamline maintenance procedures and achieve maximum reliability from the compressor plant, while maintaining the existing maintenance schedules implemented by the Aluminium Smelter plants to date. The maintenance conducted by these Aluminium Smelters has been excellent and in fact exceeds the requirements specified by Ing. Enea Mattei S.p.A. , however at 50 000 hour intervals the compressor units must be stripped down for overhaul and replacement of certain key components.

From past experience a number of logistical problems have caused overhaul costs to be inflated and in fact have not offered a reliable solution to Aluminium Smelter Plants. The replacement program however, simplifies the compressor maintenance over a five year cycle and in fact eliminates the risks involved in overhauling of equipment.

### LOGISTICAL PROBLEMS INCURRED WHILE OVERHAULING UNITS IN THE PAST:

1. Equipment damaged during transportation
2. Reliability of local engineering suppliers involved in compressor rebuilds
3. Liability for equipment during warranty period after overhaul
4. Extended downtime due to unforeseen problems, as experienced in the past.

### EXCHANGE PROGRAM PURPOSE:

The main purpose of the program is to offer a comprehensive maintenance program incorporating all existing systems and checks already instituted, however offering the Aluminium Smelters an alternative maintenance source, with total transparency and the security that the program is being conducted correctly.

### SUMMARISED IMAGES OF A COMPRESSOR EXCHANGE:



## RECENTLY PUBLISHED ARTICLES

**Myths and truths: compressor efficiency and variable speed drives***October 2007*

*The myth:* Variable speed drive compressors are more energy-efficient than traditional compressors that employ on/off control.  
*Analysis:* With many industrial facilities often operating around the clock, plant-wide efficiency is paramount. The compressed air requirements on any given industrial site can be numerous and varied. Often, each application requires varying quantities of compressed air at different pressures, and at intermittent times. The resulting fluctuation in compressor load profile can complicate the task of selecting an appropriate compressor system...

*read more*<http://instrumentation.co.za/article.aspx?pkIArticleid=4796&pkICategoryId=80>**10 years of renting air successfully***Fourth Quarter 2007*

Arthur Rushmer Engineering (ARE) was established in 1997 as a specialist service supplier for rotary vane compressors and the sole distributor for Mattei rotary vane compressors in South Africa...

*read more*<http://motioncontrol.co.za/regular.aspx?pkIRegularid=3271&pkICategoryId=375>**Air system service and maintenance: penny wise is pound foolish***Second Quarter 2008*

Kevin Rushmer of Arthur Rushmer Engineering is quite emphatic: trying to save money by reducing compressor and air system maintenance boosts electricity consumption, increases maintenance costs and compromises the life expectancy of pneumatic equipment...

*read more*<http://motioncontrol.co.za/news.aspx?pkINewsid=28982&pkICategoryId=371>**Lubrication guidelines for rotary vane compressors***Third Quarter 2008*

Arthur Rushmer Engineering has compiled a 17-page document on this subject and has given Motion Control permission to host the guide on its website so that readers can access it in its entirety.

The following serves as an introduction...

*read more*<http://motioncontrol.co.za/regular.aspx?pkIRegularid=3668&pkICategoryId=374>**Screw vs rotary vane compressors: technology and maintenance***Fourth Quarter 2008*

Different technology compressors show differing wear patterns, behave differently as they wear and have differing maintenance, lubrication and ownership costs...

*read more*<http://motioncontrol.co.za/news.aspx?pkINewsid=31102&pkICategoryId=371>**Lloyds Register ISO certifies Arthur Rushmer Engineering***Fourth Quarter 2008*

Arthur Rushmer Engineering's (ARE) quality management system has been approved by Lloyds Register Quality Assurance as meeting the requirements of ISO 9000:2000. The approval covers the sale, service and maintenance of air compressors and associated ancillaries until 10 May 2011...

*read more*<http://motioncontrol.co.za/news.aspx?pkINewsid=31085&pkICategoryId=375>**Compressed air shortages? Solve inadequate compressed air supply problems***1st Quarter 2009*

Many compressed air users believe that upgrading to a larger air receiver will provide more compressed air and solve all inadequate compressed air supply problems...

*read more*<http://motioncontrol.co.za/news.aspx?pkINewsid=31690&pkICategoryId=371>