

# **ALD Heat Treat Services**

**March, 2022**

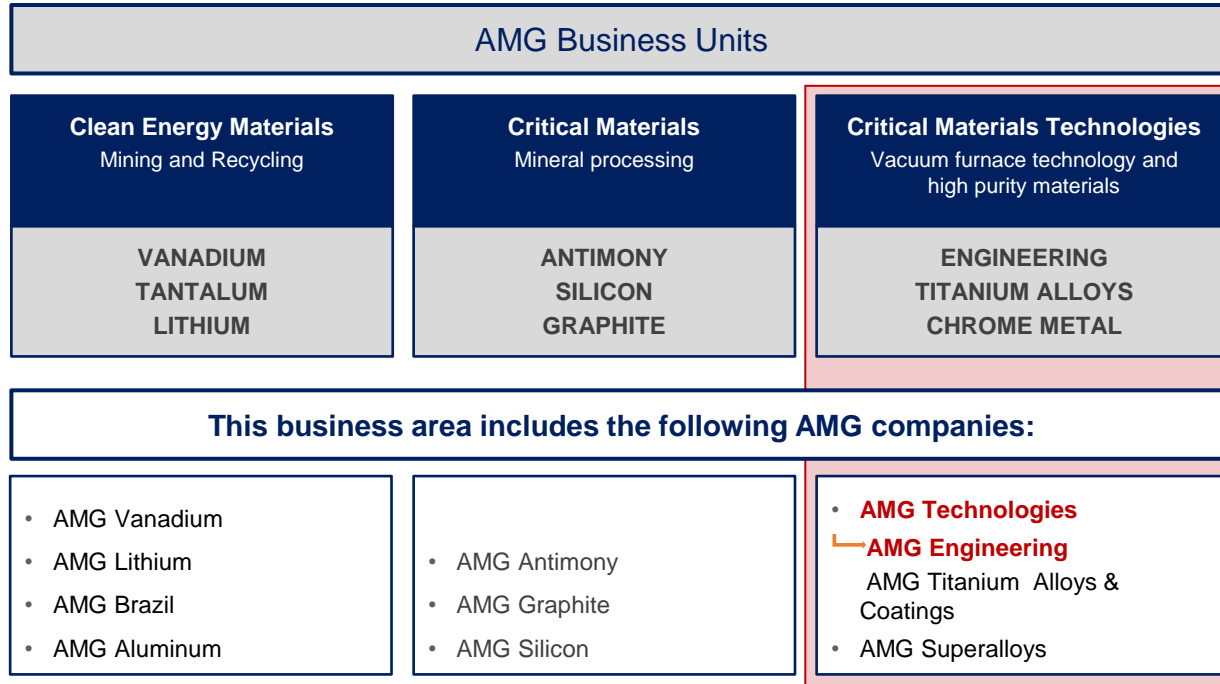
# Agenda

## Welcome / Introductions

- ALD Company Overview
- Why Chose ALD?
- ALD Expertise
- Total Cost Advantage
- Stellar Quality History
- Contacts
- Representative Parts



# AMG Advanced Metallurgical Group N.V.



- Approx. 3,000 employees
- 937 m US\$ annual revenues in 2020
- Founded in the Netherlands in November 2006, IPO July 2007, Euronext listed
- Production facilities in Germany, UK, France, U.S., China, Mexico, Brazil, India, Sri Lanka, Mozambique

# AMG Advanced Metallurgical Group N.V.

## AMG Critical Materials Technologies

### AMG Technologies

#### AMG Engineering



The world's leading manufacturer of vacuum equipment for vacuum metallurgy and heat treatment:

- Vacuum remelting
- Plasma melting
- EB-melting
- Induction melting
- Powder production
- Sintering
- Precision casting
- Turbine blade coating
- Solar silicon crystallization
- Vacuum heat treatment
- Vacuum case-hardening with gas-quenching

#### AMG Titanium Alloys



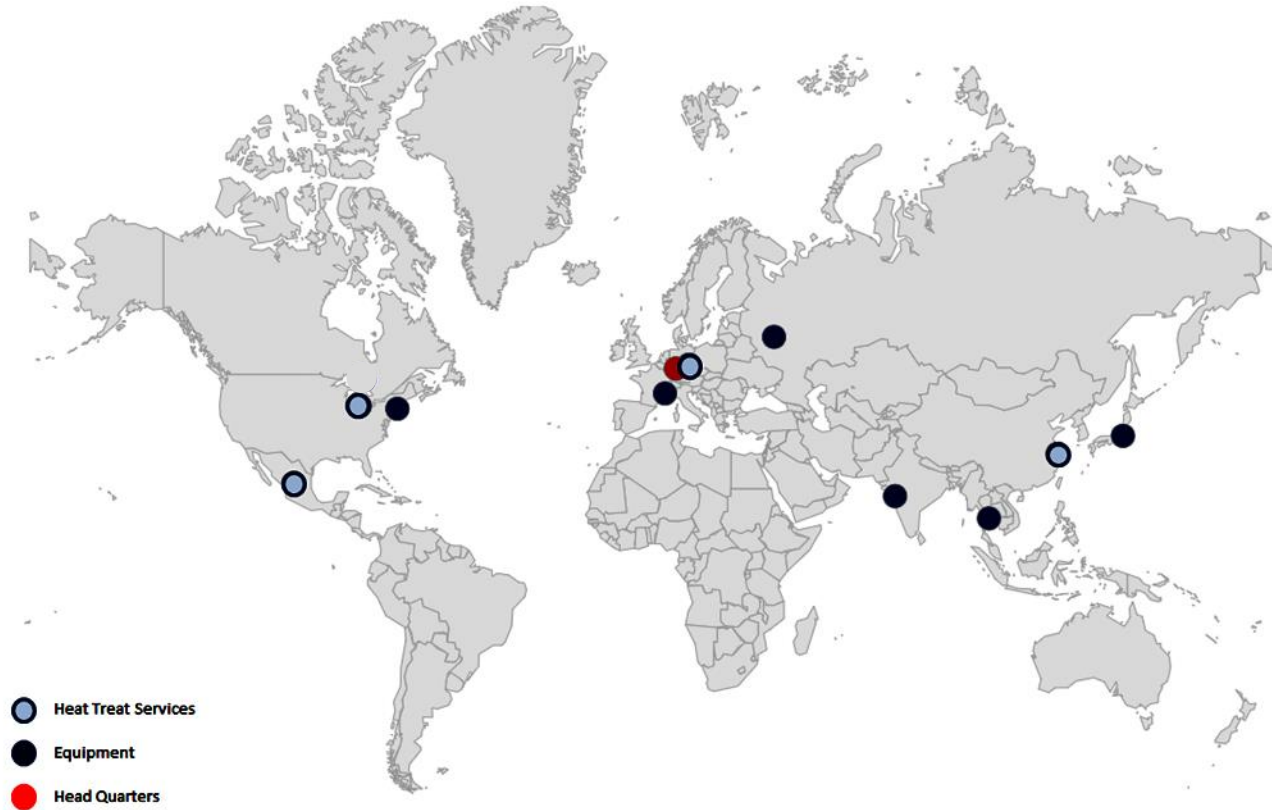
AMG Titanium Alloys & Coatings produces specialty titanium and super alloys, coatings, vanadium chemicals and powders at its facilities in Nuremberg, Germany.

#### AMG Superalloys



Based in Rotherham, UK, AMG Superalloys UK is a highly specialized manufacturer of specialty products to the aluminum, steel, superalloy, hard-facing, welding and glass industries.

# AMG ENGINEERING – Locations



## Europe

- Hanau, Germany
- Limbach-Oberfrohna, Germany
- Grenoble, France
- Moscow, Russia

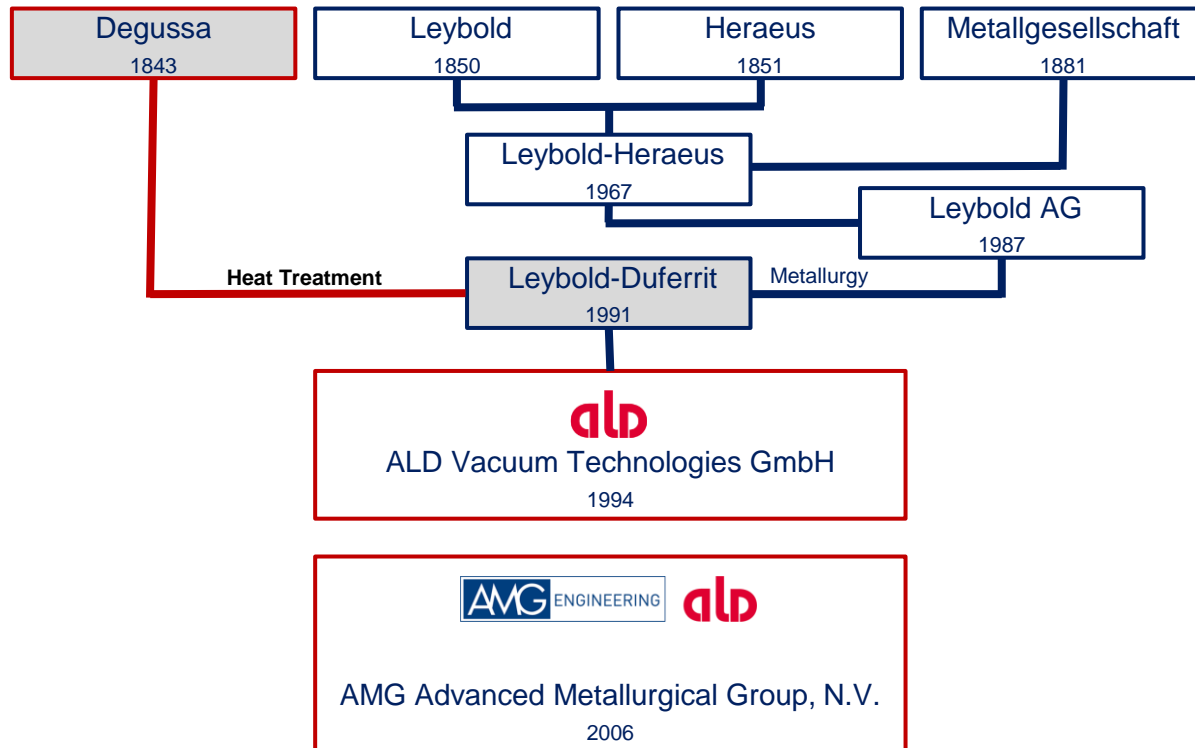
## America

- Port Huron, MI, USA
- East Windsor, CT, USA
- Ramos Arizpe, Mexico

## Asia

- Mumbai, India
- Suzhou, PR China
- Tokyo, Japan
- Bangkok, Thailand

# AMG ENGINEERING



- Individual solutions for vacuum metallurgy and vacuum heat treatment sector
- Worldwide care and maintenance service of ALD high-quality equipment for their entire lifecycle.
- ~ 850 employees
- Engineering facilities in Germany, France, U.S., India and China
- Four heat treatment service centers (HTS) in Germany, the U.S., Mexico, and China
- Owns 63 patent families

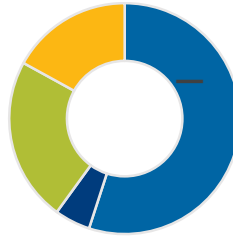
# AMG Engineering – Key figures 2020

## Revenue by Regions



Americas	39 %
Germany	12 %
Europe	15 %
Asia	34 %

## Revenue by Markets



Energy	17 %
Transportation	55 %
Infrastructure	5 %
Special metals, Chemicals	23 %

### Key figures: (31.12.2020)

Revenue: 224,4 EU€ m

Employees: 807

### Installed systems (ALD):

- Asia: 40 %
- Europe: 40 %
- Americas: 20 %



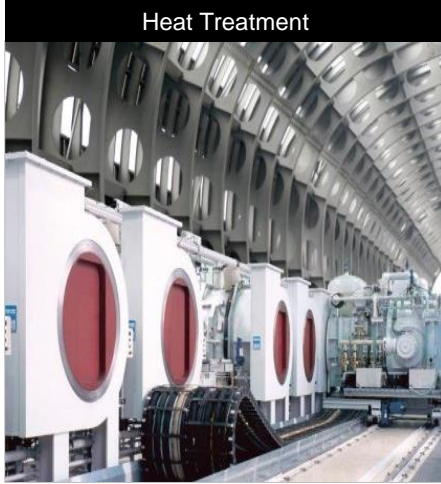
# AMG ENGINEERING – Business Segments

## Engineering

Metallurgy



Heat Treatment

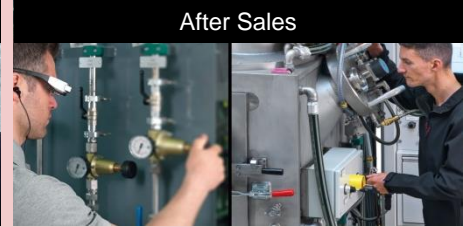


## Services

Automation & Industrial IT



After Sales



EB Melting Services



Heat Treatment Services





# AMG ENGINEERING – Products

## INVESTMENT CASTING



VAR-SM  
VIM-IC  
LEICOMELT

## POWDER ATOMIZATION



VIGA  
EIGA

## THERMAL BARRIER COATING



EB/PVD  
Smart Coater

## VACUUM INDUCTION MELTING



VIM  
VID  
VIDP

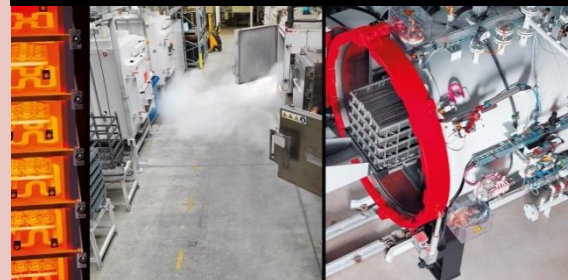
## REMELTING & REFINING



EB-CHR  
PAM

ESR  
VAR

## VACUUM HEAT TREATMENT



MonoTherm  
DualTherm

SyncroTherm  
ModulTherm

VKP (Sintering-HIP)  
Special Furnaces

# ALD HTS Global Footprint

**Port Huron US**



**ALD HT HEADQUARTERS**  
**Hanau, Germany**



**Limbach-Oberfrohna, Germany**



**Ramos Mexico**



**Suzhou, China**  
September, 2021



**Central Mexico**  
Considered 2023



# ALD VACUHEAT Limbach-Oberfrohna, Germany

**Established** 1999/2000

## **Technologies/Services:**

- LPC & HPGQ (ModulTherm®, VZKQ)
- Tempering
- Brazing
- Annealing
- De-Oiling

## **Capacity:**

- 3 ModulTherm® systems with 14 treatment chambers
- 3 Dual chamber furnaces
- Various other pre- & post processing facilities

## **Production Record:**

**>150 Million Injection Components**

- (i.e. approx. 40 Million Cars)
- 0 Field ppm since 2000 SOP
- ~ 50 Employees

## **Limbach-Oberfrohna, DE - Equipment**



ModulTherm-4 System with individual Vacuum pump sets



De-Oiling Furnace (for PM Parts)



# ALD TT Port Huron, MI United States

**Established** 2006 “Sister Plant” of Ramos Arizpe

## Technologies/Services:

- LPC & HPGQ (ModulTherm®)
- Washing / Pre-Oxidation
- Tempering / Gas Nitriding
- Ferritic Nitro Carburizing (FNC),
- Abrasive After Treatment (Shot Peen/Blast)
- Cryogenics

## Capacity:

- 4 ModulTherm® Systems with **24** treatment chambers
- 2 Dual chamber furnaces & 3 nitriding furnace
- Various other pre- & post processing capability

## Production Record:

**>10 Million Automatic Transmissions**

(up to ~5,500 Transmissions/Day... 60-70 Tons/Day)

- Field ppm since 2006 SOP
- ~55 Employees



## Port Huron, US – Equipment



**ModulTherm-4 Furnace System**



**Eddy Current Testing**



**Metallurgical Lab**  
(Hardness/Microstructure)

# ALD TT Ramos Arizpe, Mexico

**Established** 2008 “Sister Plant” of Port Huron

## **Technologies/Services:**

- LPC & HPGQ (ModulTherm®)
- Gas Nitriding & Ferritic Nitro Carburizing (FNC)
- Washing, Pre-Oxidation, Tempering
- Abrasive After Treatment (Shot Peen/Blast)
- Cryogenics

## **Capacity:**

- **3** ModulTherm® Systems with **19** Treatment Chambers
- **1** VZKQ Dual Chamber & **1** Nitriding Furnace
- Various other Pre & Post Processing Facilities
- Extensive Equipment Service Capabilities

## **Production Record:**

**>7 Million Automatic Transmissions**

- 0 Field ppm since 2008 SOP

## Ramos Arizpe MX - Equipment



### ModulTherm-7 Furnace System



**Nitriding Furnace**  
(Payload 2.5 tons)



**Abrasive Process**



**Cutting Lab**

# ALD HTS in China

## Equipment available in phase 1 :

- 1 ModulTherm® system with 6 treatment chambers
- 7 Temper furnaces
- 2 Industrial washer
- 3 Pre-oxidation furnaces
- Cryogenic units (upon request)
- Metallography and related equipment

## As expert in vacuum heat treatment we offer :

- Low Pressure Carburizing (LPC)
- High Pressure Gas Quenching (HPGQ) with  $N_2$  / He
- Vacuum Processing
  - Neutral hardening, brazing, annealing
- Pre-cleaning
- Tempering
- Cryogenics (upon request)
- Rust protection after treatment
- Metallurgical analysis
- Heat treatment consultancy
- Certified quality management

Wujiang Economic and  
Technological  
Development Zone

## Suzhou, CN - Equipment



ModulTherm-7 Furnace System

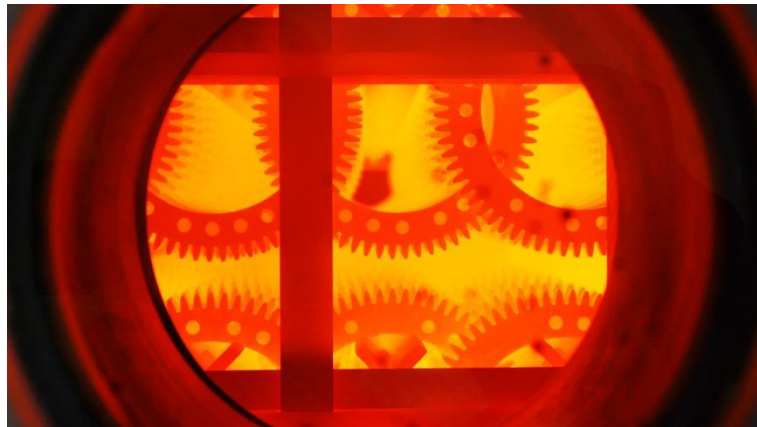




# Why Choose ALD?

**World Leader in LPC/HPGQ with 35 Years of Operational Experience**  
**>1 Billion parts processed with 0 field ppm's**

- Delivering Minimal and Predictable Distortion Control
- Quality Control: (GM Supplier Quality Excellence Award 8 consecutive years)
- Traceability; Individual part traceability is possible (2D matrix pre-heat treat)
- On time delivery with quick turn around times
- Root cause analysis expertise
- Fast response for development
- Unique R&D capabilities



# Where is ALD's Expertise?

- Any Parts requiring low distortion & superior quality control
  - Gears for automotive and all other applications
  - Driveline systems (Joints, Cages, Tripods, Spiders)
  - Cam shafts and sliding cams
- Powder metal parts (e.g. Gears for automotive powertrain systems)
- Shafts and crank shafts
- Thin walled parts (synchronizer rings, actuator components, etc.)
- Parts with blind holes
- Fuel injection parts
- Anything hard to clean / parts with higher cleanliness requirements



# Where is ALD's Expertise?

## Process Development

The ALD Engineering team works hand in hand with our customer's Engineering team to develop processes yielding optimum results.

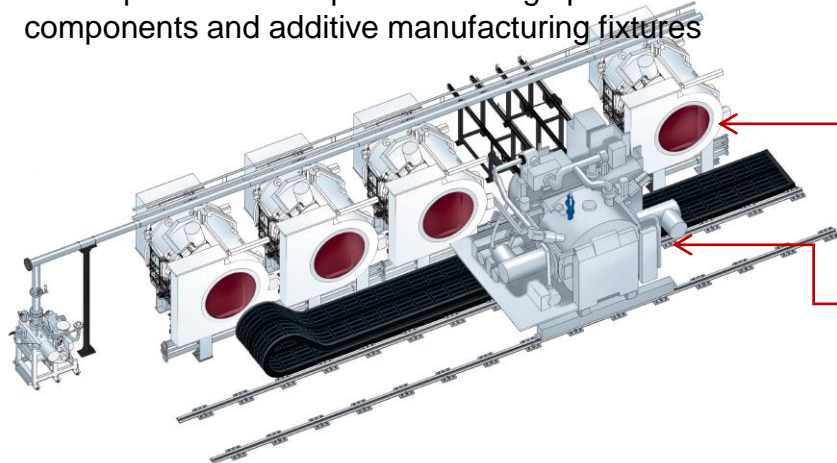
Trial loads for various transmission and driveline projects

	Port Huron	Ramos
2019:	374	319
2020:	339	307
2021:	379	372 (Steel), 218 (AL)
2022:	44 (as of mid-February)	

# What we do and How we do it

## ModulTherm® (LPC & HPGQ)

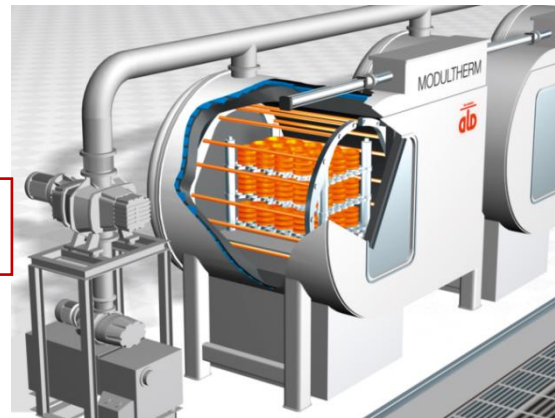
- Best-in-class for superior distortion control
- Elimination/minimization of hard finishing of processed parts
- Capability for Helium or Nitrogen quench
- Cryogenic processing in place for specific metallurgical requirements (no retained austenite)
- Development trials in process for high performance eDrive components and additive manufacturing fixtures



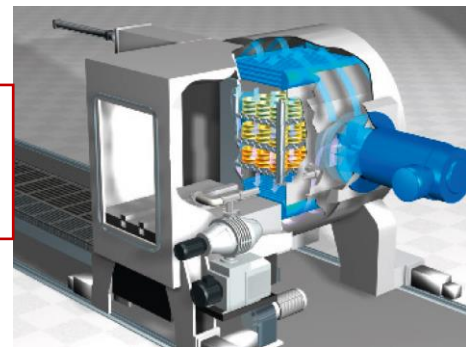
Treatment Chamber

Shuttle Module  
Transport and  
Quench Chamber

## Low Pressure Carburizing (LPC)



## High Pressure Gas Quench (HPGQ)



# What we do and How we do it

## Nitriding / Ferritic Nitro Carburizing (FNC)

- Low temperature process for minimal distortion
- Used where a hard wear resistance surface is required
- Cost effective, large loads, long cycle times



# ALD's Total Cost Advantage

## Conventional Process Chain



## ALD Streamlined Process Chain



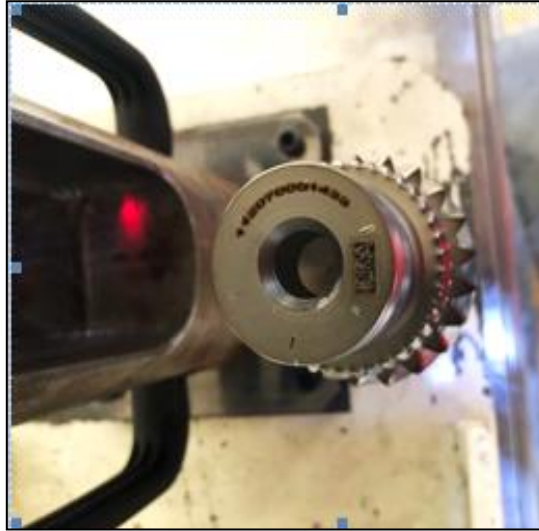
## Benefits of HPGQ vs. Liquid Quench

- Reduced Distortion
- Clean Surfaces
- Better Fatigue Resistance
- Minimal Variation (load to load)
- Fewer Steps ➤ Less Cost
- Clean Shiny Parts
- Environmentally Friendly > 99%
- Flatness & Additional Distortion Control



# Individual Part Traceability

- Individual parts must be marked so that traceability from the steel heat lot through the complete heat treat, shot peen, process.
- Laser etching process produces man and machine readable codes



# Certificates, Awards & Highlights

## Certified to:

- IATF 16949 : 2016
- AS9100D\*
- ISO 9001 : 2015



## Compliant to:

- CQI-9
- OHSA 18001
- ISO 27001
- ISO 14001



\*Recommended for Continued Certification

## GM Supplier Quality Excellence 8 consecutive years



- Safety: On Average <1 LTA/year
- Low employee turnover in all facilities
- International Engineering Network (GER, US, MX, CHN) including unique expertise in the world

# Proven Production Quality

- **ALD Port Huron:**

Processed > 233M parts for GM in PH @ 0 field ppm since 2006

- Supported > 10M transmissions
- Processed > 176M parts for other customers in PH @ 0 field ppm since 2006

- **ALD Ramos:**

Processed > 120M parts in Ramos @ 0 field ppm since 2008

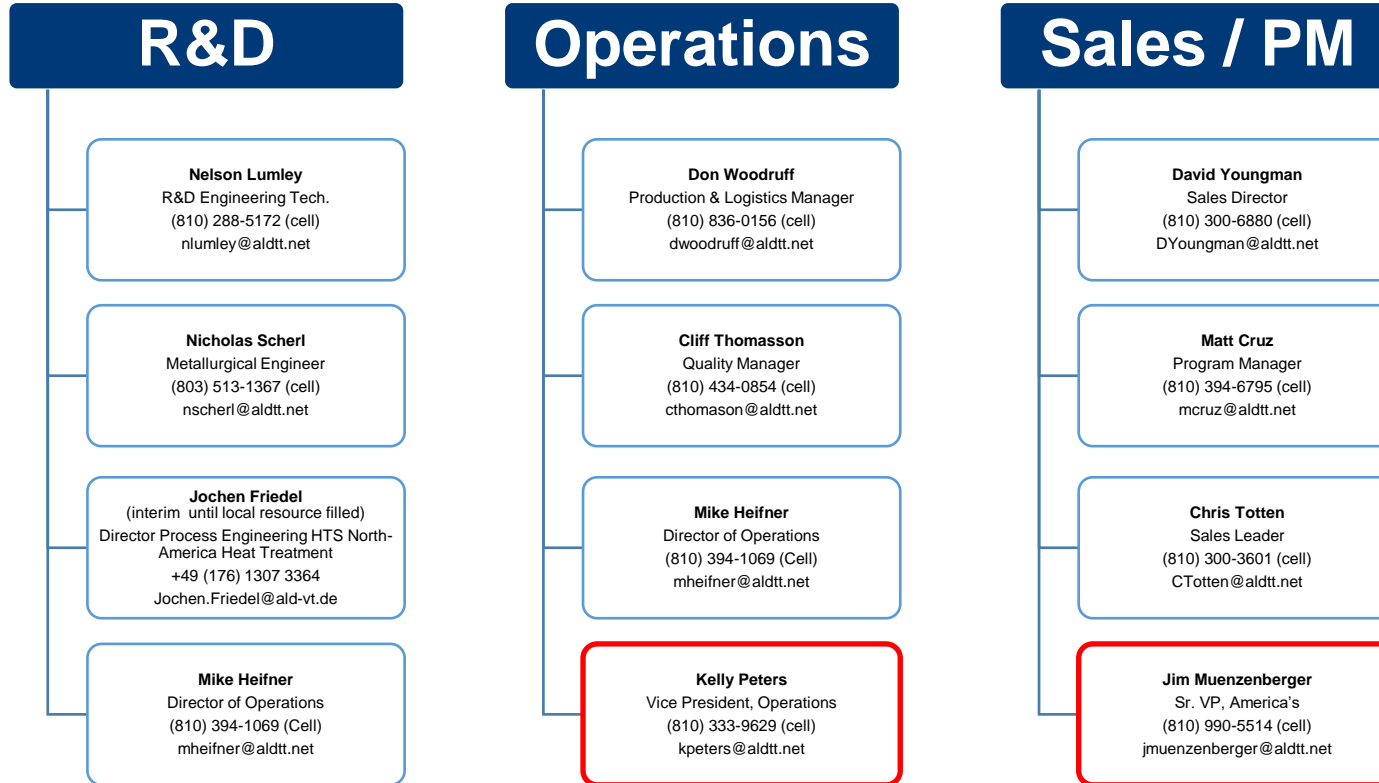
- Supported > 8M transmissions

- **ALD VACUHEAT Limbach-Oberfrohna:**

Processed > 200M high pressure fuel injection nozzles

- 0 field ppm since 2000

# ALD Port Huron Support Team



# ALD Ramos Support Team

## R&D

**David Luna**  
R&D Engineer  
+52 (844) 277-2248 (cell)  
dluna@aldtt-mexico.com

**Alan Almaguer**  
Metallurgical Engineer  
+52 (844) 456-9798 (cell)  
aalmaguer@aldtt-mexico.com

**Jochen Friedel** (remote support)  
Director Process Engineering HTS  
North-America Heat Treatment  
+49 (176) 1307 3364  
Jochen.Friedel@ald-vt.de

**Orlando Garcia**  
Metallurgical Manager  
+52 (844) 427-8054 (cell)  
ogarcia@aldtt-mexico.com

## Operations

**Gerardo Moreno**  
Logistics / Production scheduling  
Supervisor  
+52 (844) 350-1249 (cell)  
gmoreno@aldtt-mexico.com

**Alfredo Rodriguez**  
Quality Manager  
+52 (844) 277-8584 (cell)  
arodriguez@aldtt-mexico.com

**Gustavo Salas**  
Production & Logistics Manager  
+52 (844) 277-2243 (cell)  
fsalas@aldtt-mexico.com

**Jesus Calderon**  
Vice President, Operations  
+52 (844) 277-2252 (cell)  
jcalderon@aldtt-mexico.com

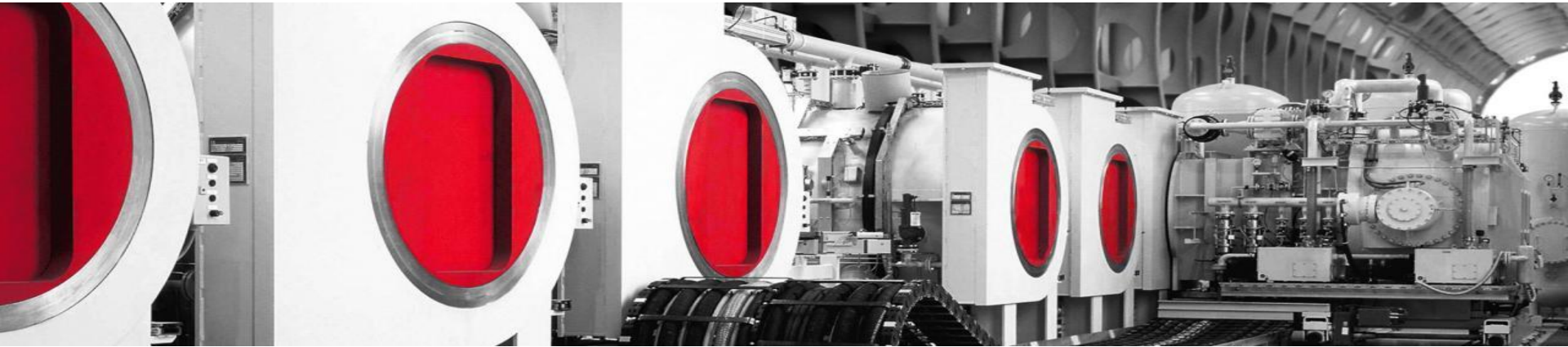
## Sales / PM

TBA

**Matt Cruz**  
Program Manager  
(810) 394-6795 (cell)  
mcruz@aldtt.net

**Antonio Vazquez**  
Sales Director  
+52 (844) 277-2257 (cell)  
avasquez@aldtt-mexico.com

**Jim Muenzenberger**  
Sr. VP, America's  
(810) 990-5514 (cell)  
jmuenzenberger@aldtt.net



**Samples of typical production parts**



# Back Up: Examples to consider

## Sample of Heat Treatment Parts (I)



Gears



Shafts



Driveline Systems



# Back Up: Examples to consider

## Sample of Heat Treatment Parts (II)

Driveline Systems

Cages



Crankshafts



Spiders



Tripods



Sprockets



Pistons



# Back Up: Examples to consider

## Sample of Heat Treatment Parts (III)

Races



Couplings



Drill bits



Steering Nuts



Dies



Bearings



# Back Up: Examples to consider

## Sample of Heat Treatment Parts (IV)

Drive Transfer



Internal Gears



Arrow Heads



Injector bodies



Studs for Aircraft



Engine Lobes



# Back Up: Examples to consider

## Samples of Brazing Parts

Coolers/Heat Exchangers  
(Automotive/Truck Appl.)



Axial Flow Compensators  
(Non Automotive)





# Thank You

