Content

1. Brief introduction
2. Strategy
Brief introduction

- Supervising body: China Aviation Industry Corporation (AVIC)
- Founded: June, 1965
- Area: 530,000 Square meters (530 acre) (old facility)
- Employees: 2,200
- Total Turnover in 2014: $260 Millions
- Export turnover in 2014: $14 Millions
- Three top international customers: Boeing, Airbus, MBD
Brief introduction

Location

Xi'an HYFC Sanyuan base
HYFC Jingwei base
Xi'an Airport
Brief introduction

Financial growth summary

Million US Dollar

2009~2014 Total turnover

2009~2014 export turnover
Brief introduction

Core Business

Civil

Defense

Aviation, Aerospace, shipbuilding

Steam & gas turbine blade, Nuclear power blade, High speed train forgings

Export

Aviation, Steam & gas turbine blade
Brief introduction

Organization chart

The President

HR Dept.
- Administration Office
  - Purchasing Equipment Dept.
  - Production Dept.
  - Machining Plant
    - Big Forging Plant
    - Press Plant
    - Small Forging Plant

Vice president
- Energy Supply Dept.
  - Equipment Dept.
  - Purchasing Dept.

Vice president
- Tech. Center

Vice president
- I&E Dept.
  - Project Management Dept.

Vice president
- Quality Dept.
  - Office Management Dept.

Vice president
- Financial Dept.

CFO
- Assistant of President

Assistant of President
- Civil Products Company
  - Casting Plant

Domestic Sale Dept.

Financial Dept.

Test Center

Purchasing Dept.

HT Plant
Brief introduction

International customers

- BOEING
- AIRBUS
- GOODRICH
- SAFRAN Messier-Bugatti-Dowty
- Rolls-Royce
- Minebea
- Mettis Aerospace
- United Technologies
- HITACHI
- TOSHIBA
- ALSTOM
- SIEMENS
- GE
- TT
### International cooperation status

<table>
<thead>
<tr>
<th>Customer</th>
<th>Material</th>
<th>Size</th>
<th>Forging Weight</th>
<th>Cooperation history</th>
<th>Total part No.</th>
<th>Total quantity delivered</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBD</td>
<td>35NCD16 300M 4340</td>
<td>≤ 2m</td>
<td>≤ 185kg</td>
<td>20 years</td>
<td>18 Part No.</td>
<td>25,000 pcs</td>
</tr>
<tr>
<td>Boeing</td>
<td>Ti-6Al-4V, AMS4928</td>
<td>≤ 2.3m</td>
<td>≤ 250 kg</td>
<td>32 years</td>
<td>15 Part No.</td>
<td>15,000 pcs</td>
</tr>
<tr>
<td>Airbus</td>
<td>Ti-6Al-4V, AMS4928</td>
<td>≤ 1.5 m</td>
<td>≤ 80kg</td>
<td>20 years</td>
<td>7 Part No.</td>
<td>18,000 pcs</td>
</tr>
<tr>
<td>Customer</td>
<td>Material</td>
<td>Size</td>
<td>Forging Weight</td>
<td>Cooperation history</td>
<td>Total part No.</td>
<td>Total quantity delivered</td>
</tr>
<tr>
<td>-------------</td>
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<td>---------------------</td>
<td>----------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>UTAS</td>
<td>4340M15-5PH</td>
<td>≤ 3m</td>
<td>≤ 1200kg</td>
<td>22 years</td>
<td>13 Part No.</td>
<td>8,000pcs</td>
</tr>
<tr>
<td>Rolls-Royce</td>
<td>TI-6AL-4V, MSRR9951</td>
<td>≤ 1.5m</td>
<td>≤ 200 kg</td>
<td>15 years</td>
<td>11 Part No.</td>
<td>2000 Pcs</td>
</tr>
<tr>
<td>NMB</td>
<td>S99/144/14515-5PH</td>
<td>≤ 1m</td>
<td>≤ 100kg</td>
<td>10 years</td>
<td>8 Part No.</td>
<td>10,000pcs</td>
</tr>
</tbody>
</table>
1. Typical Ti-alloy forging for Boeing & Rolls-Royce

**B747-8 Ti-alloy forging**
- **Material:** Ti6Al4V
- **Size:** $2100 \times 580 \times 350$
- **Equipment:** 630KJ

**B747-4 Ti-alloy forging**
- **Material:** Ti6Al4V
- **Size:** $1800 \times 320 \times 80$
- **Equipment:** 630KJ
HYFC Ti-alloy forging

2. Typical Ti-alloy forging for Airbus

A340 Ti-alloy forging
Material: Ti6Al4V
Size: 600×52×98
Equipment: 630KJ

A340 Ti-alloy forging
Material: Ti6Al4V
Size: 550×402×130
Equipment: 400KJ

A320 Ti-alloy forging
Material: Ti6Al4V
Size: 580×560×65
Equipment: 630KJ
3. New Ti-alloy forging for Airbus

A320 NEO PW Ti-alloy forging
Material: Ti6Al4V
Equipment: 630KJ
4. HYFC Ti-alloy forging for Rolls-Royce

Titanium ring & disc for Rolls-Royce
5. Developing Ti-alloy forging.
HYFC Landing Gear Forging

1. Typical Landing Gear forging for MBD

**A340 steel forging**
- **Material:** 300M
- **Size:** 932×182×70mm
- **Equipment:** 8,000T

**A340 steel forging**
- **Material:** 300M
- **Size:** 833×584×170mm
- **Equipment:** 630KJ
2. Typical Landing Gear forging for UTAS

**B747 steel forging**
- **Material:** 4340M
- **Size:** 1800 × 425 × 363 mm
- **Equipment:** 630KJ

**737 steel forging**
- **Material:** 300M
- **Size:** 926 × 490 × 229 mm
- **Equipment:** 400KJ
## Brief Introduction

**DVI Forgings for MBD**

<table>
<thead>
<tr>
<th>B787</th>
<th>A350</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Upper Side Brace Spindle</strong></td>
<td><strong>Lower Forward Cardan Pin</strong></td>
</tr>
<tr>
<td><strong>Lower Side Brace Spindle</strong></td>
<td><strong>Upper AFT Cardan Pin</strong></td>
</tr>
<tr>
<td><strong>Drag Brace Spindle</strong></td>
<td><strong>Lower AFT Cardan Pin</strong></td>
</tr>
</tbody>
</table>
HYFC Facility capability

1. Open Die forging equipment:
   Air-hammer:
   560Kg; 1Ton; 2 Ton; 3 Ton
   Hydraulic Presses:
   100T; 1,600T; 2500T
   Ring Rolling Machines:
   350mm; 1,200mm; 2,200mm; 2,500mm
2. Closed die forging equipment:

Air-hammer: 1 Ton; 2 Ton; 3 Ton; 5 Ton

Counter-blow hammer: 160KJ; 250KJ; 400KJ; 2 sets 630KJ

Screw press: 300 Ton; 1,000 Ton; 8,000 Ton

Oil hydraulic Presses: 3,150 Ton; 10,000 Ton; 20,000 Ton
3. NDT equipment
HYFC can perform Contact & immersion UT, PT, MT and X-ray test.
Our advanced engineering and design team allow us to process and methods to effectively meet the requirements of our customers.

(1) Use of simulation software which can predict metal flow, stress and temperature.

(2) Our dedicated engineering team use the design systems such as:

- **2-D software**: CAXA2010
- **3-D software**: CATIA V5 R23
- **Simulation software**: Deform and forge 2013
Check 2D Drawing 3D Model Customer

Design Route

2D Drawing 3D Model Customer → Check

Y: Compile Tec. Scheme → 2D Drawing 3D Model HYFC

Die-making

Y: Simulation

Optimization of process parameters

N: Submit MOM to Customer

N: Compile all of the MOM

N: FAI

Y: Submit DVI to Customer

N: Submit MOM to Customer

Y: Mass Production Approval

N: Approval
Brief introduction

HYFC Quality System Assurance

ISO9001 2008: AS9100C Approval:
Quality management system

Nadcap approval:
Non destructive test-MPI&PT
Heat treatment
Test lab

Test lab approval:
ISO17025:2005
<table>
<thead>
<tr>
<th></th>
<th>Chemical Analysis</th>
<th>Mechanical Testing</th>
<th>Metallography and Microindentation Hardness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hyrogen</td>
<td>Room Temperature Tensile</td>
<td>Metallography(general)</td>
</tr>
<tr>
<td></td>
<td>Nitrogen</td>
<td>Elevated Temperature Tensile</td>
<td>Near Surface Examinations-Microindentation(Surface)</td>
</tr>
<tr>
<td></td>
<td>Oxygen</td>
<td>Stress Rupture</td>
<td>Metallography(Macro)</td>
</tr>
</tbody>
</table>
## HYFC Quality System Assurance

### Nadcap Audit for Laboratories

<table>
<thead>
<tr>
<th></th>
<th>Hardness Testing (Macro)</th>
<th>Brinell Hardness</th>
<th>Rockwell Hardness</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Mechanical Testing</td>
<td>Standard Specimen Machining</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Specimen Heat Treating</td>
<td>Specimen Heat Treating</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>NDT</td>
<td>Penetrant Test</td>
<td>Magnetic Particle Inspection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ultrasonic Test (will be approved by the end of 2015)</td>
</tr>
</tbody>
</table>
Various material products by Market sales

- HYFC Ti-alloy forging
- TI-alloy products, 30%
- Superalloy products, 28%
- Al-alloy products, 12%
- Steel products, 25%
- Others, 5%
HYFC Jingwei base is located in Xi'an Economic and Technological Development Zone. This new base construction project includes 20,000 Tons hydraulic press, 35,000 tons Electric screw press, rough machining and die-making production line and one numerical simulation center.
Technical Parameters of 20,000T Heavy-duty Close Die & isothermal Forging Hydraulic Press

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Pressure</td>
<td>200MN (20000Tons)</td>
</tr>
<tr>
<td>Stroke</td>
<td>1600mm</td>
</tr>
<tr>
<td>Max. Closure Height</td>
<td>3600mm</td>
</tr>
<tr>
<td>Work-table Dimension</td>
<td>4000×6000mm</td>
</tr>
<tr>
<td>Speed of closed die forging</td>
<td>0.5-10mm/s</td>
</tr>
<tr>
<td>Speed of Isothermal forging</td>
<td>0.005-0.5mm/s</td>
</tr>
</tbody>
</table>
20,000 Ton hydraulic press have been put into production.
1. Brief introduction
2. Strategy
1. HYFC extends the supply chain, not only produce forgings, also perform the rough machining.
Strategy

CNC machine center
Strategy

CNC machine center
Strategy

Other Machining Equipment
### The main parameters of CNC equipment

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Name</th>
<th>Working table size (X/Y/Z)</th>
<th>Accuracy (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>KMC–645G</td>
<td>$6500 \times 3700 \times 1200$</td>
<td>$0.01 \sim 0.02$</td>
</tr>
<tr>
<td>2</td>
<td>KMC–433G</td>
<td>$4500 \times 2500 \times 1200$</td>
<td>$0.01 \sim 0.02$</td>
</tr>
<tr>
<td>3</td>
<td>DBM–3020</td>
<td>$3000 \times 2000 \times 1000$</td>
<td>$0.01 \sim 0.02$</td>
</tr>
<tr>
<td>4</td>
<td>LP–4021Y</td>
<td>$4000 \times 2500 \times 760$</td>
<td>$0.01 \sim 0.02$</td>
</tr>
<tr>
<td>5</td>
<td>FV–3219</td>
<td>$3200 \times 1800 \times 750$</td>
<td>$0.01 \sim 0.02$</td>
</tr>
<tr>
<td>6</td>
<td>FV–4219</td>
<td>$4200 \times 1900 \times 760$</td>
<td>$0.01 \sim 0.02$</td>
</tr>
<tr>
<td>7</td>
<td>FUM2600L</td>
<td>$2600 \times 1000 \times 1200$</td>
<td>$0.01 \sim 0.02$</td>
</tr>
</tbody>
</table>
### The main parameters of CNC equipment

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Name</th>
<th>Working table size (X/Y/Z)</th>
<th>Accuracy (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>CPV1600B</td>
<td>1600 × 830 × 750</td>
<td>0.01～0.02</td>
</tr>
<tr>
<td>9</td>
<td>VB-825</td>
<td>1600 × 800 × 750</td>
<td>0.01～0.02</td>
</tr>
<tr>
<td>10</td>
<td>FVP-800A</td>
<td>800 × 500 × 550</td>
<td>0.01～0.02</td>
</tr>
<tr>
<td>11</td>
<td>NC-50V</td>
<td>850 × 510 × 550</td>
<td>0.01～0.02</td>
</tr>
<tr>
<td>12</td>
<td>NC-50V</td>
<td>850 × 510 × 550</td>
<td>0.01～0.02</td>
</tr>
<tr>
<td>13</td>
<td>TH42160C</td>
<td>4000 × 1600 × 900</td>
<td>0.01～0.02</td>
</tr>
<tr>
<td>14</td>
<td>MC-2600P</td>
<td>2600 × 900 × 750</td>
<td>0.01～0.02</td>
</tr>
</tbody>
</table>
Machining Products

Thickness is 15mm

2－Φ12H8
Thickness is 12mm

2-Φ12H8
The short term strategy

2. Going into business field of MBD Ti-alloy forgings and midsize forging

3. Sales revenue in 2014 is $260 Millions and will reach $320 Millions in 2015

4. Export revenue in 2014 is $14 Millions and will reach $25 Millions in 2015
### Five-year-Investment plan

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Quantity</th>
<th>Contract signed</th>
<th>Manufacturing</th>
<th>Installation and commission</th>
</tr>
</thead>
<tbody>
<tr>
<td>20000 Ton hydraulic press</td>
<td>1 set</td>
<td>End of 2011</td>
<td>Mid of 2013</td>
<td>Aug. of 2014</td>
</tr>
<tr>
<td>35000 Ton electric screw press</td>
<td>1 set</td>
<td>End of 2015</td>
<td>End of 2017</td>
<td>End of 2018</td>
</tr>
<tr>
<td>6000 Ton hydraulic press</td>
<td>1 set</td>
<td>End 2017</td>
<td>End of 2018</td>
<td>End of 2019</td>
</tr>
<tr>
<td>1600 Ton hydraulic press</td>
<td>1 set</td>
<td>End of 2015</td>
<td>End of 2016</td>
<td>End of 2017</td>
</tr>
<tr>
<td>3150 Ton hydraulic press</td>
<td>1 set</td>
<td>End of 2016</td>
<td>End of 2017</td>
<td>End of 2018</td>
</tr>
</tbody>
</table>
## Five-year-Investment plan

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Quantity</th>
<th>Contract signed</th>
<th>Manufacturing</th>
<th>Installation and commission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating furnace</td>
<td>6 sets</td>
<td>End of 2011</td>
<td>Mid of 2013</td>
<td>May of 2014</td>
</tr>
<tr>
<td>Heating furnace</td>
<td>10 sets</td>
<td>End of 2013</td>
<td>End of 2014</td>
<td>End of 2015</td>
</tr>
<tr>
<td>Heat treatment furnace</td>
<td>5 sets</td>
<td>Early of 2014</td>
<td>End of 2015</td>
<td>End of 2016</td>
</tr>
<tr>
<td>Forge simulation</td>
<td>1 sets</td>
<td>Aug. of 2014</td>
<td>N/A</td>
<td>Sept. of 2014</td>
</tr>
</tbody>
</table>
THANK YOU