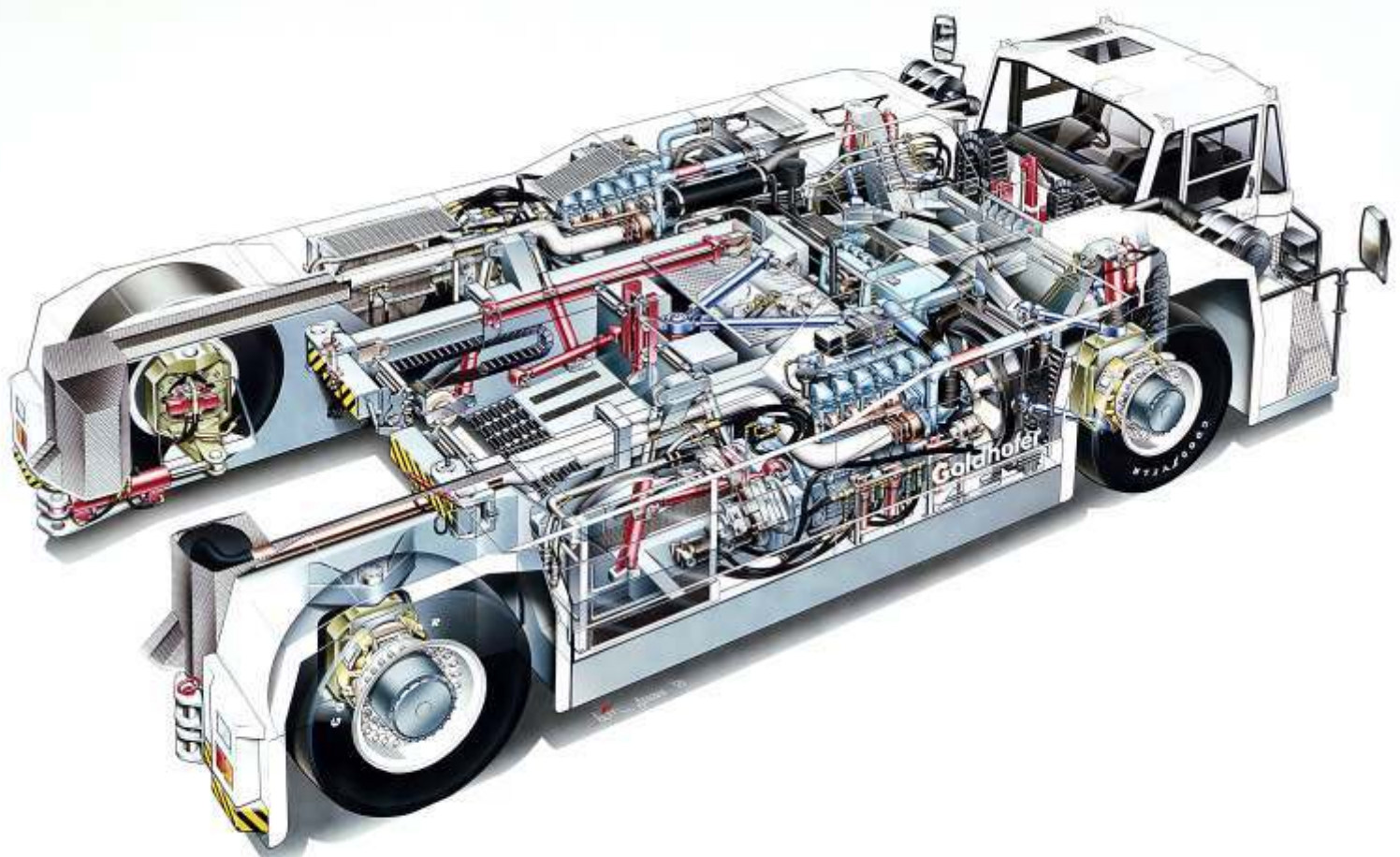


Michael Bammel



Heavy Haulage vehicles built by Goldhofer



Michael Bammel



The Chronicle
of the
Goldhofer AG

Memmingen



Heavy-Haulage-History (c) by Dipl.-Ing. Michael Bammel

1705

The Goldhofer forge in Amendingen is first mentioned



In the 18th century (1705) the forge of the Goldhofer family in Amendingen is first mentioned by documentary evidence.

Anton Goldhofer, the father of Alois Goldhofer, was able to build up a good reputation with his forge due his excellent craftsmanship, even in the economic depressions at the beginning of the 20th century and between the World Wars.

Pic. 1

Alois Goldhofer was born on 20 April 1922 in the village of Amendingen near the town of Memmingen.

1922

Alois Goldhofer was born

Alois Goldhofer was born on 20 April 1922 in the village of Amendingen near the town of Memmingen.



Pic. 3

Agricultural Goldhofer trailer



Pic. 2

Anton Goldhofer, Alois Goldhofer's father in 1936

1946

Agricultural trailers



Pic. 4
"Founding picture" in front of the old workshop in Amendingen. Sitting Anton Goldhofer, far right Alois Goldhofer

In 1946, the 8th generation of the family heritage, Alois Goldhofer started with the steel construction of agricultural trailers with pneumatic tyres. Therefore he founded the company "Allgäuer Fahrzeugwerke Alois Goldhofer KG" (South German vehicle plant Alois Goldhofer limited partnership) and with the new workshop in the "Veitensteige" in Amendingen near Memmingen he created the requirements for economic production.

1952

First lowloader with rear-end loading (type TU)



Pic. 5
First lowloader with rear-end loading, designed by Alois Goldhofer in 1952

In cooperation with the tyre producer Metzeler (this company developed the necessary small tyres on 15" -rims), Alois Goldhofer built a lowloader with ramps for rear-end loading, that was taken as a yardstick from the entire branch.

Thanks to this vehicle the clientele, originally mainly from the agricultural branch, expanded to the transport and construction market.

1956

Lowbed trailers with detachable rear axle (type TL)



Pic. 6
Alois Goldhofer in front of one of his lowloaders

In order to cope with the growing payloads, Alois Goldhofer developed a special axle construction for lowloaders, which could easily be separated and detached from the vehicle after lowering the loading platform, thus making the process of loading and unloading easier.



Pic. 7
Lowbed trailer type TL, loading platform lowered

1959

Heavy-duty lowloaders (type TA)

The sales success, especially in the construction of lowloaders, made the conversion from manual to industrial production possible and at the same time necessary: at todays headquarters of the Goldhofer AG in Memmingen, Donaustrasse 95, a brand new plant was built in 1959 for the developing and producing vehicles for the transport and construction industry which were constantly becoming bigger and heavier.



Pic. 8
Registered in Holland: Diamond T 980 with...



Pic. 9
... a Goldhofer lowloader TA6 with a permissible gross weight of 120 t

1963

Heavy-duty trailers with mechanical axle suspension and mechanical steering (type TPA)



*Pic. 12
Two TPA4 ready for coupling*

As is often the case, it was the idea of a customer, that led to the development of completely new heavy-duty combination trailers with mechanical axle suspension. At a time, when the hydraulic system was not yet that

advanced, Alois Goldhofer had developed a modular system, that made it possible for the clients to combine a vehicle combination corresponding to the load of up to eight axle lines, made up of two-axle modules each, thus being able to transport different loads economically with just one vehicle system. The different loading platforms, that were already at that time telescopic or adjustable in width, completed this system. These vehicles were the "predecessors" of today's modular system of vehicles with hydraulic axle load compensation (THP).



*Pic. 10
TPA8-combination*



*Pic. 11
TPA8 with vessel (D 6 m L 13 m weight 160.000 kg)*

1964

Delivery of the 5000th Goldhofer vehicle (type TL)

On 8 September 1964 the 5000th Goldhofer lowloader (type TL8/60 with a payload of 8000 kg at 60 km/h) was delivered.



*Pic. 13
The 5000th Goldhofer lowloader*

1971

The first extendible lowbed semitrailer (type STN)

In 1971 Goldhofer built the first extendible lowbed semitrailer with hydraulic displacement steering, with a loading platform that can be optimally adjusted to the cargo.



*Pic. 14
the first extendible Goldhofer Lowbed-Semitrailer*

1975

A world novelty: combination semi lowloader with knuckle-type steering axles and hydraulic axle suspension (type SKPH)



Presentation of a new construction series of combination semitrailers type SKPH with hydraulic axle suspension.

This vehicle type offers the possibility of using a heavy-duty vehicle system economically by combining a heavy-duty transport vehicle with two semi lowloaders with several axles.

Pic. 17

SKPH 6 Lowbed semitrailer combination

1979

More than 10,000 Goldhofer vehicles are operated in about 56 countries all over the world

The delivery of the 10,000. Goldhofer trailers was the reason for this photograph of the complete staff and management of the Goldhofer company in 1979.



Pic. 18

Staff and management gather for delivery of the 10000 st Goldhofer lowloader

1979

World heaviest transport on wheels with a Goldhofer modular-trailer: 1.200 t Reaktorvessel (Type THP/H)



Pic. 19
2x2 THP/H12 in parallel combination

Load: 1.200 t reaktor vessel, Length 24,38 m, Diameter 7,93 m, 48 axlelines with 384 tires, konvoi length more than 120 m with 5 towing and 2 pushing tractors, total gross weight over 1.500 t.

The modular trailer combination for a payload of 1,200 t, christened "Colossos", was delivered in November 1979 from Memmingen to the customer VSL Corporation in USA.



Abb. 21
2x2 THP/H12 in parallel combination



Pic. 20
2x2 THP/H12 in parallel combination

1981

Alois Goldhofer dies on 16 January 1981 during a short trip to the mountains.

1982

Further development of the modular system for heavy loads with skidding frame for an exact placing of the load.



*Pic. 25
THP/H 24 side-by-side combination in Memmingen ready for final inspection by customer*

The patented skidding frame is mounted on top of a parallel platform combination of type 2 x THP/H24 with a width of 7.5 m and a length of 38.4 m with a payload of 1,200 tons distributed on a total of 384 wheels.

This vehicle combination was built for transporting 1,200 tons modules for a gas exploration plant in the Arco Kuparuk Field in Alaska.

The patented skidding frame is used to position individual modules to within a millimetre and unload them quickly.



*Pic. 23
Goldhofer THP/H 24 P with 1.200 t module*



*Pic. 22
Melroe prime mover in front of a Goldhofer THP/H 24 side-by-side combination on the way back for the next module*



*Pic. 24
These vehicle dimensions can only be realized by means of an hydraulic axle load compensation*

1983

Special vehicles to haul the heaviest loads over the most difficult terrain under the toughest environmental conditions (type STUE)



*Pic. 26
STUE4 payload rated at 100 t for unpaved ways*

New markets with a low infrastructure require other vehicle concepts: sturdy, unsteered pendular axles with big tyres provide safe and economical transport, even on unpaved ways.

1985

Delivery of the 15,000th Goldhofer vehicle (type SKPH)

The 15,000. Goldhofer trailer was built for the Bracht Company in Erwitte / Germany: a semi-trailer type SKPH 6-60/80. Equipped with a special lifting device for the telescopic main-beam (weight 55 t) of the Gottwald mobile crane type AMK 600.



*Pic. 27
SKPH 6 with huge 11.00-20 tyres and lifting device for a 55 tons telescopic derrick boom of a Gottwald mobile crane type AMK 600*

1987

Construction of one of the heaviest and biggest vessel bridges of the world



*Pic. 28
girder frame on two THP/LV 16-axlelines modular trailers*

In June 1987, the biggest high girder frame built by Goldhofer to date, leaves the plant for transporting payloads of up to 250 tons in Thailand on top of two THP/LV 16 bogies with 16 axle lines each and a total of 256 wheels. The vehicle combination consisting of platforms and high girder frame, without pushing and pulling tractors, was 70 metres long. Two Titan tractors of 540 hp each were used.

1987

Development of the first towbarless aircraft tractor (type AST)



*Pic. 29
AST prototype ready for delivery*

In 1987 the development of towbarless aircraft tractors began, which unlike the hitherto used tractors with towbar, pick up the nose-gear of the aircraft and thus do not have to bear the weight any longer.



Pic. 31
AST-prototype with DC9

This prototype is still being used in 2005 at Zurich airport, after more than 30,000 service hours.

The first AST-prototype tried and tested by Swissair.

Originally designed for aircraft of 180 tons, the prototype with a weight of 12,000 kg is equipped with a KHD V10-cylinder-diesel type F10L413 of 206 kW (280 hp).



Pic. 30
AST-prototype with DC10

1989

Aircraft recovery system for the recovery and transport of damaged wide-body aircraft (type ARTS)

The development of the aircraft recovery system ARTS arose from the experiences that happened during the recovery of a B747 with heavy-duty vehicles in India in 1988. A local haulage firm carried out the recovery of a damaged Boeing with partly improvised means under the direction of Goldhofer engineers.



Pic. 32
ARTS (Aircraft Recovery and Transportation System) on duty in Frankfurt

As a result the idea arose of using know-how and experiences gained from the construction of special vehicles for ground handling.

1989

The first selfpropelled modular trailer system with hydrostatic drive system was delivered (type PST und PSP)



*Pic. 36
first selfpropelled module, coupled with trailer modules*

Goldhofer delivered the first selfpropelled modules with hydrostatic drive system, to be combined with the well-known Goldhofer modular trailer system type THP/SL, to a customer in Taiwan.



*Pic. 35
impressive: the hydraulic axleload compensation*



*Pic. 34
the 800t load on a modular tractor / trailer unit*

With these modules loads up to 800 tons were moved.



*Pic. 33
this load is longer than 160 meters!*

1989

Development of an electronically synchronized steering system and an electronic track control

The electronic synchronized steering system is used to freely place any modular vehicle combination e.g. under gigantic drilling platform modules and they can then be steered synchronously together. The electronic track control can be used to align semitrailers equipped with manual auxiliary steering while driving through bends without the combination having to put straight beforehand.

1989

Construction of the biggest special high girder frame for reactor transport with a payload of 385 t

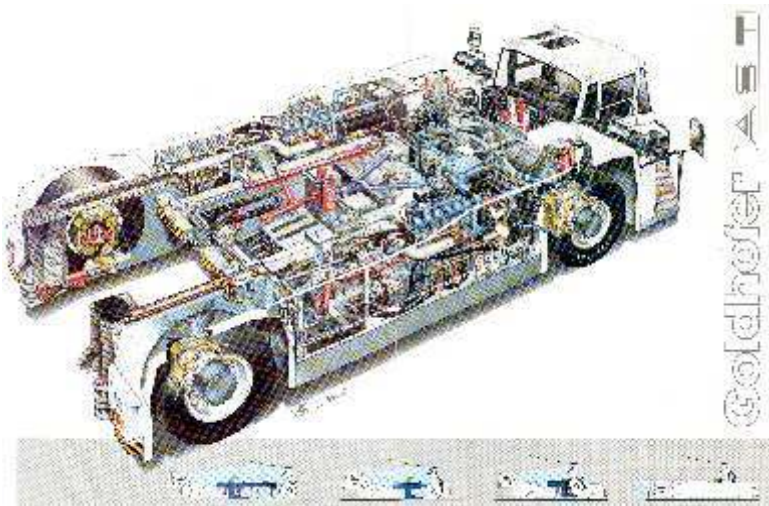
This heavy high girder frame was bought from former East Germany shortly before the borders were opened in order to transport reactors and other heavy construction elements for new nuclear power plants. On a total of 2 x 14 axle lines this nearly 60 metres long vehicle combination was able to transport payloads of up to 385 tons on 224 wheels. Transport height of this high girder bridge reached 5 metres!



*Pic. 37
girder frame trailer with max. payload of 385 t on test ride at Goldhofer company in Memmingen*

1991

First order for an aircraft tractor from Swissair



Pic. 38
General layout of the first Goldhofer aircraft tractor type AST-1 A 840

Following positive results after testing the first towbarless aircraft tractor, Swissair placed an order for the construction of a corresponding tractor type AST-1 A 840 with two six-cylinder diesel engines and a total output of 840 hp for towing wide-body aircraft up to Boeing B747 (jumbo-jet) with a take-off weight of 400 tons.

1993

Self-propelled heavy-duty modules with electronic multi-way steering



Pic. 39
Four heavy-duty modules coupled one after the other with 24 axle lines

The first self-propelled heavy-duty modular transporter with fully-electronic steering and 4 x 6 axle lines was delivered to Japan in 1993.

This six-axle basic module with a total of twelve driven swing axles can reach 820 kN tensile force, this is enough (combined with other load-bearing modules) for transporting a total weight of 2,000 tons on plain terrain. Each of the four powerpacks has a diesel engine of 400 hp for hydrostatic drive.

1993

More than 20,000 Goldhofer vehicles are operated in over 60 countries all over the world



*Pic. 40
the 20,000. Goldhofer trailer is ready for delivery!*

The 20,000. Goldhofer trailer was delivered in 1993.



*Pic. 41
2 narrow track axles positioned in front of 3 steering axles*

1994

Introduction of a patented narrow track axle for semitrailers



*Pic. 42
Narrow track axle between the tracks of an excavator*

Goldhofer is the only European vehicle manufacturer who offers the patented narrow track axle programme. The advantage of this programme is the optimized position of its centre of gravity and a longer useable lowbed while the total combination length remains the same, especially for transporting self-driven tracked construction machines with an inside chain width of 1,790 mm.

1994

Development of a steering actuation with a steering angle of 45 degrees with easy maintenance for bogies with knuckle-type steering axles

After finishing a series of intensive long-running tests, Goldhofer is even able to grant a functional guarantee of 250,000 km for the newly developed steering actuation.

1995

Enlargement of the aircraft tractor family to three construction sizes



Pic. 43

The AST-family is complete: From right to left, AST-1, AST-2 and AST-3

After delivery of more than 10 aircraft tractors type AST-1 (with 600 hp for aircrafts weights up to 400 t) and AST-2 (with 400 hp for aircraft weights up to 280 t), the well-known tractor family grows up with a small tractor type: AST-3.

The AST-3 (with 130 hp) for the cost reducing movement of smaller aircrafts up to 160 t.



Pic. 44

AST-1 ready for pick-up of an aircraft



Pic. 45

Nose-gear is picked up

1997

Digital CAN-Bus technology for Goldhofer aircraft tractors



*Pic. 46
two of this AST-1 F 600 were delivered to Japan*

After delivery of more than 30 aircraft tractors Goldhofer started the development of the second generation in 1997.

By means of the increased utilization of intelligent control systems, connected with each other by a CAN-Bus-System, which do not only control the pick-up device but also the digital hydrostatic drive system, substantial progress is made in the field of diagnostic-ability. The necessary software for the digital

control system is developed by Goldhofer employees who successfully carried out the tests for the prototype of the towbarless aircraft tractor.

1998

Incorporation of flatbed semitrailers with turntable steering into the product range



*Pic. 47
Telescopic flatbed semitrailer type SPZ-DL*

With up to six axle lines, payloads of over 60,000 kg can be reached. They are triple telescopic and can reach a loading platform length of a maximum of 45 m. Today these vehicles are increasingly used for transporting rotor blades for wind power plants.

2000

The 100th aircraft tractor, an AST-3 F 200 is delivered to Vienna airport



*Pic. 48
Handing over of the one hundredth aircraft tractor*

The 100th aircraft tractor, an AST-3 F 200, was handed over to Vienna airport during a small ceremony in July 2000.

In the same year Goldhofer received an order for building 13 aircraft tractors for the new construction of Athens airport, just in time for opening the Olympic Games.

In production the aircraft tractors have already reached a share in the turnover of nearly 25%.

2000

Goldhofer delivers the 25,000th lowloader



*Pic. 49
the 25.000th Goldhofer trailer was a type TU3-24/80*

The 25,000th Goldhofer lowloader is a typical construction machine transporter, type TU3-24/80 with a payload of 24 t at 80 km/h. The construction type of this vehicle goes back to the first lowloader with rear-end loading built by Alois Goldhofer in 1952.

2001

Delivery of the first aircraft tractors to China



*Pic. 50
The first Goldhofer aircraft tractor in China.*

The very first two Goldhofer aircraft tractors were delivered to Air China Corporation.

Worldwide more than 160 Goldhofer AST aircraft tractors are on duty for more than 700.000 working hours and performed more than 2,000,000 (two million!) aircraft movements.

2002

First self-propelled modules with optimized pivot bearing (type PST/ST)

Goldhofer developed self-propelled modules for the ADAMS company in Belgium with pivot bearing, instead of the hitherto used ball bearing race rings, which are compatible with all existing THP/ST or THP/LT -modules.



*Pic. 51
Operation of the new self-propelled module for transporting the yacht "Elegance"*

A powerpack with an output of 330 kW (450 hp) provides up to twelve drive axles with two hydraulic engines each. Payload ranges of several 1,000 tons can be reached by coupling non-propelled modules.

This combination is operated by remote control, the so-called "vendor's tray", and can reach speeds of approx. 5 km/h loaded or 15 km/h unloaded.

2003

Development of optimized platform modules (type THP/UT)



*Pic. 52
THP/UT platform modules with two and four axle lines are combined to form a six-axle trailer*

The advantages of the latest THP/UT construction series are their reduced bogie height of lowered only 770 mm with a stroke of 600 mm by using low profile tyres size 205/65 R17.5...



*Pic. 53
THP/UT platform modules with 3 + 3 + 2 axle lines in an eight-axle semitrailer combination*



*Pic. 54
THP/UT platform modules with two and three axle lines in a semitrailer combination*

... and at the same time it was possible to achieve very high frame resistance and an extremely high permissible bending moment for a reduced deflection under load.

2003

Exclusively air-operated disc brakes are used even with heavy platform modules (type THP/UT)



*Pic. 55
THP/UT platform modules with 2 + 4 + 2 axle lines are combined to form an eight-axle semitrailer*

Until now the problematic space situation of the platform modules had prevented the introduction of a disc brake.

There are, in fact, solutions for using hydraulic disc brakes but in this case you do not only need special brake hydraulics but also additional pressure converters in order to be able to operate such a platform combination with the compressed-air system of the tractor. This solution which was put into effect has room for a directly air-operated disc brake in the new platform modules of the THP/UT series.



*Pic. 56
THP/UT with air-operated disc brakes*



*Pic. 57
THP/UT with air-operated disc brakes*

2004

Delivery of fully-electronic steerable modular transporters with a hitherto unequalled construction height of only 920 mm



*Pic. 58
PSP module transporter with drilling rig module before being loaded onto a barge*

Development of fully -electronic steerable modular transporters with a hitherto unequalled construction height of only 920 mm lowered + 600 mm stroke with a steering angle of 2 x 135° and an axle load per swing axle of 18,000 kg.



*Pic. 59
PSP module transporter with drilling platform loaded*



*Pic. 60
PSP module transporter prepared for the next load*



*Pic. 61
PSP module transporter with drilling rig module before being loaded onto a barge*

2004

Development and construction of the biggest towbarless aircraft tractor in the world

In order to be able to move the new airbus A380 with a maximum weight of 600 tons quickly, Goldhofer develops the three-axle AST-1 X. Equipped with a maximum of two V8 diesel engines with 440 kW / 600 hp each, the AST-1 X still reaches a maximum speed of 30 km/h towing a 300,000 kg aircraft. With its all-wheel steering, the AST-1 X can operate in a very confined space despite its width of 4,500 mm and its length of 11,250 mm.



Pic. 62
Design of the AST-1 X 1200 with the new Airbus A380

2005

AST-1 X roll-out

Even before the maiden flight of the new airbus A380, the AST-1 X is presented to the first customer in March 2005.



Pic. 63
AST-1 X 800 with B747 in Frankfurt

2005

More than 28,000 Goldhofer vehicles are operated in over 70 countries all over the world