



SAN ENGINEERING & LOCOMOTIVE CO. LTD.



PRODUCTS ENGINEERED TO LAST

SAN Engineering is a leading manufacturer of locomotives, power packs, gear boxes, cardan shafts and a variety of innovative and technologically superior rail products. SAN has earned distinction for designing products that help companies achieve their productivity goals and keep the cost of ownership low.

SAN offers a complete range of locomotives, diesel hydraulic and diesel electric, power packs for over head equipment cars, self propelled vehicles, cranes and many others. The company's portfolio of gear boxes has found wide application across industries; whether it is the battle tank, the sugar crusher, the steel mill, conveyors, cement plant or the power plants. SAN products have been used either in their production, maintenance or other applications..

HISTORY

SAN was established in 1969 as a locomotive manufacturing company. Over the years, the company has grown its product portfolio and aligned its offering to changing market requirements. Today, SAN is a multi-product, multi-market enterprise that provides solutions in all segments of industries.

SAN is built on a strong foundation of innovation and technological excellence. Strategic partnerships to strengthen our in-house engineering capabilities and market reach, continuous focus on research and development, and a customer-centric approach have marked the company's journey in the design and manufacture of locomotives, power packs and gear boxes.

WHY SAN?

Whether it's in the partnerships that we forge or the products that we design, we take pride in building long-term relationships with our customers and making long-lasting impact in their businesses. SAN is today known for the reliability of its products, superior technology, manufacturing capabilities and values that stem from our core belief of making long-term investments and commitments.

We are an ISO 9001:2008 company that has employed best-in-class practices and set up advanced capabilities to manufacture products to meet international standards. The company strongly believes in adopting good business processes and practices, and strives for continuous improvement to provide best returns to its customers. Our customers and partners choose us because of our strong reputation for quality and service, and our tradition of reliability



MANUFACTURING CAPABILITIES

SAN is one of the few companies capable of designing, manufacturing transmissions, gear boxes, power packs and locomotives. Transmission and the drive elements are manufactured in-house using state-of-the-art machining centers and gear profile grinders.

SAN manufacturing facilities are located in two plants, Bangalore and Mysore and are equipped with advanced, high precision CNC horizontal and CNC vertical machining centers. The in-house five axis machines provide SAN with the advantage of producing bevel gears and rotor parts of great accuracy. The gear grinders are capable of manufacturing gears to very high standards. The manufacturing unit is supported by the R&D division that leads the SAN development program, a SOLID EDGE unit with advanced design capabilities, an integrated machine shop and a metrology laboratory. Our manufacturing capability is further strengthened with the adoption of the world class manufacturing systems and also an ERP. The delivery of better quality products with reduced time-to-market has positively impacted customer satisfaction levels

QUALITY INITIATIVES

The SAN quality system is established in line with ISO 9001:2008 Quality Management System Standard. We have demonstrated our commitment to quality by investing in state-of-the-art facilities that conduct quality tests on SAN products. These include advanced measurement systems for gears, state-of-the-art co-ordinate measuring machine, world-class metrology laboratory for calibration of measuring instruments and material testing, non-contact and non-destructive test facilities for material testing, and transmission test facility.

SAN values continual improvement and strategies of 'plan-do-check-act' are embedded in all our business processes, being monitored by our top management. SAN has established the supply feedback system (SFS) to engage our suppliers in our drive for quality. SFS is a platform for our top management to interact with our suppliers and discuss supplier performance, opportunities for improvement and problem-solving.

Training is an integral part of continual improvement. SAN has a KAIZEN reward system in place and each and every KAIZEN is analysed and rewarded on implementation. The employees are also recognized for their contribution.

PRODUCTS

SAN delivers wide range of unique engineering products-shunting locomotives, power packs, gear and gear boxes, drive line equipments and a variety of fibre glass parts.

The main products include:

- 1 Locomotives
 - Diesel hydraulic • Diesel electric
- 2 Power packs
 - OHE • SPART
- 3 Gears
- 4 Gear boxes
 - Helical • Bevel • Planetary • Axle Drives • Wheel Sets
- 5 Cardan Shafts
- 6 SAN lube
- 7 Fibre Glass parts

DIESEL HYDRAULIC LOCOMOTIVES

Our diesel hydraulic shunting locomotives are engineered to last. Powered by either a CUMMINS or a CATERPILLAR engine with a hydrodynamic transmission engineered by VOITH and built by SAN in India, the locomotives are rugged, high on performance and low on downtimes. What makes the SAN modular locomotive family different is its technology, variety, performance potential, economy and eco-friendliness.

APPLICATION

- Cement plants
- Fertilizer factories
- Power generation units
- Ports
- Refineries
- Steel Industries



FEATURES

- Designed for industry duty cycles
- High tractive effort and hence load haulage
- Fitted with a VOITH designed and SAN built turbo reversing hydrodynamic transmission
- Available in 1676, 1435, 1067 and 1000 mm gages
- Varying axle loads from 12 tons to 25 tons possible
- Provided with CB couplers and buffers
- Pneumatic air brake system
- Coil springs for suspension
- PLC variants on controls available
- Air conditioned cabin for extra comfort of the driver on request
- Creep control possible on request
- Flame proof variants available

TECHNICAL SPECIFICATION

MODEL/ DATA	WHEEL ARRAN- GEMENT	ENGINE MODEL	ENGINE POWER (KW)	SPEED (RPM)	TRANS	MODEL	ARRANGMENT	TRACTION EFFORT (KN)	MASS (TONS)
DL 400	O-B-O	Cummins NTA 855/CAT3406	298	2100	Hydro Dynamic	L2R2	Single Power Pack	132	45
DL 700	O-C-O	Cummins VTA 28L/CAT3412	522	2100	Hydro Dynamic	HDR4	Single Power Pack	199	67.5
DL 700	B-B	Cummins VTA 28L/CAT3412	522	2100	Hydro Dynamic	HDR4	Single Power Pack	265	90
DL 800	B-B	Cummins VTA 28L/CAT3412	596	2100	Hydro Dynamic	L2R2	Twin Power Pack	265	90
DL 1200	C-C	Cummins KTA 19L	450	2100	Hydro Dynamic	HDR4	Twin Power Pack	397	135
DL 1400	C-C	Cummins KTA 28L/CAT3406	1044	2100	Hydro Dynamic	HDR4	Twin Power Pack	397	135
DL 2400	C-C	Cummins KTA 50L	1100	2100	Hydro Dynamic	L4R4	Twin Power Pack	ON REQ	135
DL 3000	C-C	Cummins KTA 60L	1342	1800	Hydro Dynamic	L4R4	Single Power Pack	ON REQ	135
DL 3000	C-C	Cummins KTA 78L	2300	2100	Hydro Dynamic	L620	Single Power Pack	ON REQ	135
Options		Air Conditioning in Cabin							
		Creep Controls							
		PLC for Locomotive Control and Monitoring							
		Can be supplied for 1435mm,1000mm, 1067mm and 1676mm Gauges							

NEW DIESEL-ELECTRIC TRACTION LOCOMOTIVES

With its all-new family of locomotives, SAN is setting new standards in terms of engineering, a sound long-term investment, and quality of consultancy. Alongside the diesel-hydraulic models we now have a range of diesel electric locomotives.

APPLICATION

- Cement plants
- Fertilizer factories
- Power generation units
- Ports
- Refineries
- Steel Industries

FEATURES

- Designed for industry duty cycles
- Robust in construction
- High tractive effort and hence load haulage
- Fitted with a SAN built DC traction motors and generators or with reputed brands
- Available in 1676, 1435, 1067 and 1000 mm gages
- Varying axle loads from 12 tons to 25 tons possible
- Provided with CB couplers and buffers
- Pneumatic air brake system
- Coil springs for suspension
- PLC variants on controls available

TECHNICAL SPECIFICATION

MODEL/ DATA	WHEEL ARRAN- GEMENT	ENGINE MODEL	ENGINE POWER (KW)	SPEED (RPM)	TRANS	TRACTION MOTOR	TRACTION ALTERNATOR	TRACTION EFFORT (KN)	MASS (TONS)
DEL 700	BO-BO	Cummins VTA 28L/CAT3406	298	2100	AC/DC	SAN/ C1001TM	SAN/C 1019TA	132	90
DEL1400	CO-CO	Cummins KTA 50L	522	2100	AC/DC	SAN/ C1001TM	SAN/C 1019TA	397	126
DEL2000	CO-CO	CAT 3516B	522	2100	AC/DC	On Req	On Req	On Req	126
DEL2000	CO-CO	CAT 3516B	596	1800	AC/DC	On Req	On Req	On Req	126
Options	Air Conditioning in Cabin								
	Creep Controls								
	PLC AOR Locomotive Control and Monitoring								
	Can be supplied for 1435mm,1000mm, 1067mm and 1676mm Gauges								



POWER PACKS FOR VARIED APPLICATIONS

With its new family of locomotives both diesel electric and diesel hydraulic, SAN specializes in providing power packs for a variety of applications. These power packs are used in critical applications and are supplied to the INDIAN RAILWAYS through Integral Coach Factory and Bharat Earthmovers Limited. SAN not only supplies the power pack but also helps the coach builders in the integration process.

APPLICATION

- OHE (Over head equipment inspection cars)
- SPART (Self propelled accident relief trains)

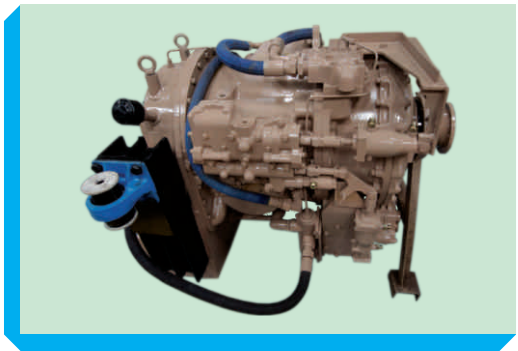


OHE (Over Head Equipment)

The car is a self propelled 2 axle driven vehicle and is used for periodical inspection, patrolling and maintenance of traction over head equipment. It is also useful for attending sites of break down/ restoration of damaged over head equipment. It is also used to erect small lengths of catenary and repair damaged contact wires.

FEATURES

- Suitable for a speed of 110 kmph
- High efficiency final drives
- Available in 1676,1435,1067 and 1000 mm gauges
- Suitable for axle loads of 17.25 tons



SPART (Self Propelled Accident Relief Train)

High Speed Self Propelled Accident Relief Train (HS SPART) is a three car utility vehicle that has

- Supervisory van
- Medical Van
- Tool Van

built by M/s Integral Coach Factory for the Indian Railways , to facilitate rescue, relief and restoration work during the railway accidents.

This equipment has a power pack designed and manufactured by SAN. One set of diesel hydraulic under slung power pack is installed in the supervisory van and also in the tool van. These under slung power packs free up the overboard floor space for housing supervisory staff and to carry auxiliary equipments. These power packs provide traction power to run the three car unit HS SPART at high speeds up to 120kmph.

Each power pack consists of major components:

- Under floor mounted:
 - One horizontal under slung diesel engine.
 - One hydrodynamic transmission.
 - One axle mounted final drive reduction gearbox.
 - Spring Coupling and cardan shaft.
- On the floor :
 - Control cubicle.
 - Driver's desk.
 - 125 KVA Capacity Diesel Alternator Unit.

FEATURES

- Suitable for a speed of 120 kmph
- VOITH T211r transmission used
- Powered by a N14R horizontal engine
- Available in 1676,1435,1067 and 1000 mm gauges
- Suitable for axle loads of 25 tons
- Sold as a complete set including power pack, final drives, generator set, controls and accessories



GEARS

Spur and helical gears:
Maximum diameter 1200 mm
Module 16

Bevel helical:
Maximum diameter 800 mm
Module 14

Planetary :
Maximum diameter 700 mm

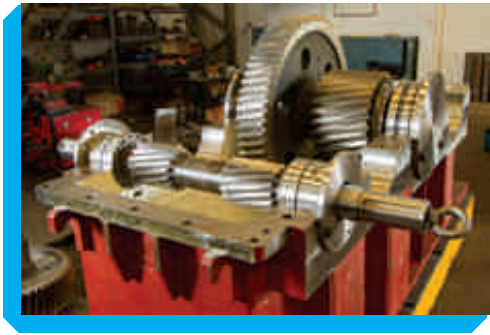


GEAR BOXES



TYPE OF GEAR BOX	NO OF STAGES	APPLICATION	INDUSTRY	
BEVEL HELICAL GEAR BOX	4	Slew Drives Ladle Turret Slag Pot Transfer Transfer Car Stacker Drier	Steel Metal Ind	<div>GEAR RATIOS 574:1 TO 79.97:1</div> <div>POWER TRANSMITTED 11 KW TO 90 KW</div>
	3	Agitator Ladle Car Windmill Slag Pot Transfer Lubricator	Steel Conveyor Windmill Power	<div>GEAR RATIOS 200:1 TO 5:1</div> <div>POWER TRANSMITTED 5 KW TO 300 KW</div>
	2	Ladle Turret Cooling Tower Mould Oscillator Conveyor Coal Mill	Cooling Towers Steel Metal Ind	<div>GEAR RATIOS 5:1 TO 32:1</div> <div>POWER TRANSMITTED 10KW TO 700 KW</div>
	1	Blower Mould Oscillator Cooling Tower Slew Drives Ladle Tilter Recoiler Bucket Wheel Drive	Paper Steel Cooling Towers Metal Ind	<div>GEAR RATIOS 1:1 TO 1049:1</div> <div>POWER TRANSMITTED 4 KW TO 500 KW</div>

HELICAL GEAR BOX

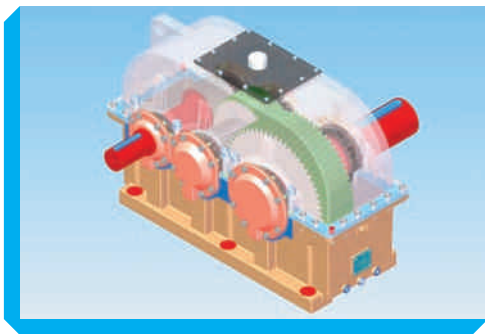


TYPE OF GEAR BOX	NO OF STAGES	APPLICATION	INDUSTRY	
HELICAL GEAR BOX	4	Stacker Wagon Tipler Ladle Transfer other	Metal Ind	<u>GEAR RATIOS</u> 300:1 TO 120:1 <u>POWER TRANSMITTED</u> 10 KW TO 224 KW
	3	Hoist Recoiler Drier Hot Metal Transfer Mixing Drum Cooler Drive others	Metal Ind Paper Fertiliser Rolling Mill Power Food	<u>GEAR RATIOS</u> 225:1 TO 1:1 <u>POWER TRANSMITTED</u> 5 KW TO 270 KW
	2	Ropeway Drive Recoiler Tension Leveller Slotter Head Mould Oscillator	Paper Fertiliser Metal Ind Power Food / Cement	<u>GEAR RATIOS</u> 7:1 TO 37:1 <u>POWER TRANSMITTED</u> 5 KW TO 220 KW
	1	Roller Table Screw Drive Ball Mill Hoist Descaling Pump	Metal Ind Valves Paper Power	<u>GEAR RATIOS</u> 1:1 TO 7.5:1 <u>POWER TRANSMITTED</u> 7.5 KW TO 1512 KW

PLANETARY GEAR BOX

TYPE OF GEAR BOX	INDUSTRY	GEAR RATIOS	POWER TRANSMITTED
PLANETARY GEAR BOX	Foundry Metal Ind Steel others	1:1 TO 7.5:1	7.5 KW TO 1512 KW

SAN DESIGNED STANDARD RANGE OF GEAR BOXES



- Sizes from 225 to 630.
- The Gears are manufactured out of Case Carburized High alloy steel with hardness of 58-62 HRC.
- SKF/FAG/TIMKEN make bearings.
- Manufactured to AGMA standards.

CARDAN SHAFTS

For almost 40 years, SAN's cardan shafts has been recognized for quality and performance and is being used in a variety of applications which includes locomotives, off highway vehicles like dump trucks, steel plants and many more industrial applications. With manufacturing facilities in Mysore, near Bangalore supported by SAN's network of distribution and after sales operations, our expertise is built on a good understanding of the drive line parts and power transmissions in the above industries.

APPLICATIONS

- Locomotives,
- Off highway vehicles,
- Steel mills,
- Paper industries,
- Cement plants

FEATURES

- Service free sealing system with special greasing allows little or no maintenance
- Less weight improves fuel economy
- Low noise and vibration
- Needle bearings for improved life



FIBRE GLASS PARTS

Fibre glass is a material with endless possibilities for commercial and industrial applications, High quality surface finish, low weight, high strength, inherent durability and resistance to corrosion makes FRP a popular choice for many product designs.

SAN manufactures FRP products by hand-lay-up, resin infusion; spray deposition and resin transfer moulding (RTM). The choice can depend upon engineering requirements, product complexity, cost limitation or output demands, whatever the objectives, SAN delivers.

Hand-lay-up & spray deposition offers economical avenues into FRP and provide a flexible solution to product development, supported by low cost tooling and within-group pattern making resources. RTM & resin Infusion creates a fully finished surface to the reverse side of the moulding with accurate control of laminate thickness.

Glass reinforcement content and orientation can be tailored to match local loading demands on the final product.

These processes also provide the facility to encapsulate cores, steel reinforcing or attachment plates and threaded inserts into the moulding, in many cases to minimize or remove the need for large sub-assemblies.

The SAN FRP design team is highly qualified to offer efficient and effective advice in the best methods of exploiting the benefits of FRP for your specific needs.

CUSTOMERS

- SCANIA
- VOLVO
- L & T
- BEML
- AJAX

SAN LUBE for final drives and transmissions

Amongst the different products SAN delivers, HP SAN Lube is a Co branded blue coloured lubricating oil that is introduced for the better performance of the hydrodynamic transmission and wheel axle final drive that results in outstanding anti wear properties, excellent oxidation stability and high FZG rating

USAGE BENEFITS

- ✓ Resistance to thermal degradation
- ✓ Very good hydraulic stability
- ✓ Enhanced filterability
- ✓ Improved FZG rating
- ✓ High Viscosity Index
- ✓ Excellent anti wear properties
- ✓ Provides higher load carrying performance compared to conventional anti wear hydraulic fluids
- ✓ Excellent Oxidation resistance
- ✓ Anti corrosive and minimal foaming
- ✓ Product fully compatible with Nitrile, Silicone and fluoro polymer seal materials.

SERVICES

To satisfy the requirements of our customers, we consistently incorporate new developments and new locomotive types in our portfolio. We do not see ourselves solely as a supplier of diesel locomotives but we add value to the customer

- in locomotive selection
- Sizing and Maintenance

During these consultations, the focus is always on the efficiency of vehicle usage. From a broad range of shunting locomotives, the customer chooses the vehicle that suits them the best in terms of performance, weight and usage.

SAN is available to its customers with advice and assistance throughout the life cycle of the locomotive. We help the customer choose the vehicle with the aid of internally developed software and provide a comprehensive service covering everything from maintenance and an efficient supply of parts to complete vehicle retrofits.

Our engineering products team is available for sizing of cardan shafts, gears and gear boxes for varied applications. With the latest engineering softwares, our design team is capable of designing customized gear boxes for varied applications.



Our Bangalore location has state of the art facilities for maintenance, repair and overhaul of transmissions and final drives of our diesel hydraulic locomotives. Our Mysore facility can refurbish and repair gear boxes and cardan shafts.

We also service bogies and frames on requests from customers.

ENGINEERING

Our products, diesel locomotives, gear boxes, gear, cardan shafts, power packs and components for railway vehicles are developed by highly experienced qualified engineers.

- Design and development up to production-readiness
- Efficiency and flexibility in design and development
- Entire design process completed using Solid works, Kiss soft, Nx
- Best design solutions by means of optimization with FEMA
- Networking of design and manufacturing using CAM
- Individually tailored problem-solving to match customer requirements

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