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VENTILATION SYSTEMS FOR TUNNEL



FALVENT is a leading manufacturer of ventilation solutions for industrial and commercial applications. With a focus on innovation and customer satisfaction, we offer a range of products designed to meet the unique needs of our clients. Our team of experts is dedicated to delivering high-quality products and exceptional service.

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WELCOME !

FALVENT INDUSTRIAL COMPANY is a Saudi rising company

focuses its business activity on the manufacture of industrial fans, ventilation systems and smoke exhaust fans, which integrates in development, manufacturing, installation, sales and after-sales services with its own factory and the strategic cooperation with main advantage manufactories, FALVENT has served and developed the professional ventilation solutions for their customers.



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Falvent try their best to adapt to the challenges and opportunities presented by rapidly advancing technologies in tunnel ventilation technology not only in Saudi Market but also in the Middle East region.

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TUNNEL VENTILATION OVERVIEW

Tunnels play a variety of roles in our daily lives, not only for roads and railroads, but also other familiar purposes. More new ideas are coming up.

There are two types of ventilation for underground tunnels: ventilation required during tunnel construction (temporary) and ventilation for tunnel operation (permanent).



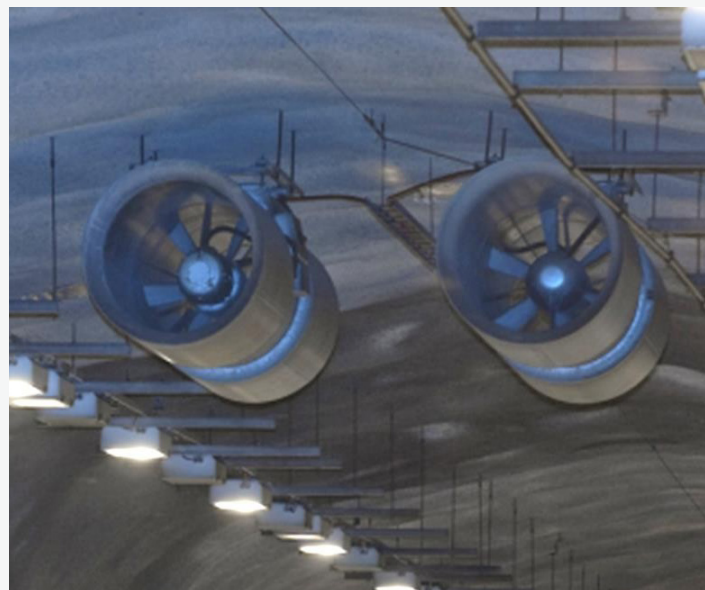
TEMPORARY VENTILATION FOR TUNNEL

The tunnel construction works are mainly carried out by drill and blast method, which have many safety and health issues due to the emission of dust and many poisonous gasses. Hence it is essential to provide external fresh air required to allow a safe environment for workers working inside the tunnel.

PERMANENT VENTILATION FOR TUNNEL

The need for tunnel ventilation is critical for the life and safety of any person utilizing the tunnels. Typically, the ventilation fans are used to dilute toxic and inflammable gases to a safe level; dust and smoke dispersed; excessive heat should be relieved; and escape routes must be kept clear from smoke.

There are three basic types of control that can be utilized: portal to portal, shaft to shaft, and portal to shaft. These are used independently or in conjunction with each other. Fans utilized are both axial, reversible and unidirectional.





WHY WE ARE DIFFERENT

FALVENT is a Saudi manufacture offers a complete solution to meet underground ventilation needs during construction and after operation to achieve the air quality and provide standard ventilation.

FALVENT work with a qualified consultants to delivery of projects on time, to an agreed cost and to the highest quality. In order to optimize our solutions, we also use advanced CFD analysis to get an effective performance.

FALVENT cooperates with the strategic cooperation with main advantage manufactories European and Chinese manufacturers specialized in tunnel ventilation to produce fans according to international manufacturing as well as in line with the Saudi market.

FALVENT starts working with its customers from the initial study of the tunnel, in order to provide an optimal solution for each project. Also, FALVENT has a technical assistance department with the following services:



Installation and Erection.



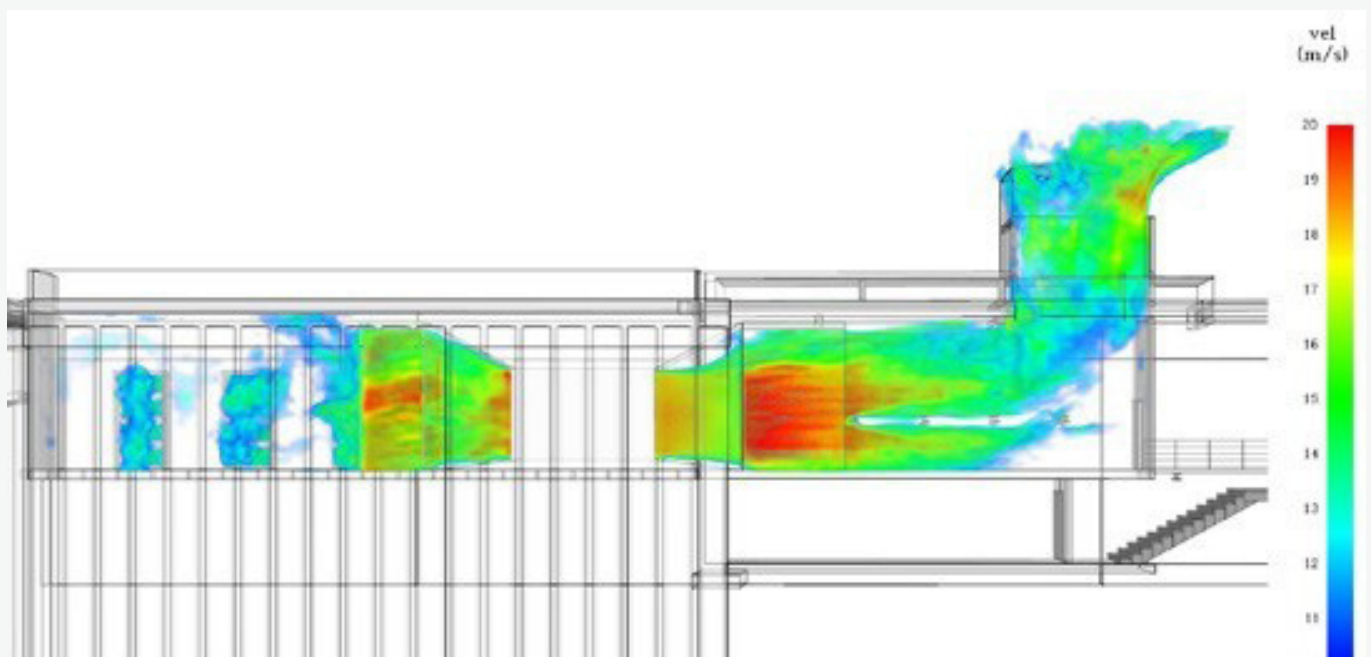
Testing and Commissioning



Maintenance and Diagnostics



Spare parts and Upgrade.



JET FANS AND LARAG AXIAL FLOW FANS

The jet fans and large flow axial fans can be used to clear the atmosphere inside the tunnel and achieve the safe evacuation during the emergency case.

TUNNEL JET FANS (CFC SERIES)

- Casing made of Carbon steel with epoxy paint protective coating, and provided with an adjustable bench that allows a wide range of motors to be installed.
- 50 mm thick and minimum length of 100 mm silencer made with 70kg/m³ density rockwool and manufactured using perforated plate inside.
- The silencers are placed on both sides of the fan casing.
- and fitted with inlet and outlet cones designed for minimum pressure loss
- Protection guard for inlet and deflector in the outlet.
- Junction box on the casing for easy on-site wiring.
- Mounting support included.
- Impeller made of aluminum alloy with size 500 mm to 1600 mm
- Trust ranges which vary from 185 N up to 2810 N. Unidirectional or Reversible blade.



- TEFC Three phase motor, 380V/60Hz.
- Degree of protection IP 55.
- Class of insulation F.
- Efficient IEC standard motor, efficiency class IE2 or IE3
- Specific bearings for operating between 20,000 h and 100,000 hours.

TECHNICAL CHARACTERISTICS

Fan type	Thrust	Motor rating	Volume flow	Air speed	Rotor RPM	Sound power
	[N]	[kW]	[m ³ /s]	[m/s]	[RPM]	[dB(A)]
CFC 500	109	2.2	4.39	22.2	2900	87
CFC 630	290	7.5	8.91	28.58	2900	90
	382	12	10.23	32.81	2900	92
	470	15	11.34	36.36	2940	93
	542	18.5	12.18	39.06	2940	94
CFC 710	388	12	11.59	29.28	2900	99
	492	15	13.06	32.98	2940	101
	573	18.5	14.09	35.59	2940	102
	663	26	15.15	38.28	2940	105
CFC 800	625	18.5	16.58	32.98	2940	105
	740	26	18.04	35.89		107
CFC 900	343	7.5	14.14	22.23	1450	92
	417	10	15.59	24.5	1470	93
	525	15	17.49	27.5	1470	95
CFC 1000	507	11	19.1	24.33	1470	95
	615	15	21.04	26.79	1470	96
	695	18.5	22.36	28.48	1470	97
	749	22	23.22	29.57	1470	98
CFC 1120	713	15	25.38	25.76	1470	97
	805	18.5	26.98	27.37	1470	97
	869	22	28.01	28.43	1470	98
	1004	30	30.11	30.56	1470	100
CFC 1250	1030	22	34.04	27.74	1470	100
	1198	30	36.71	29.91	1470	101
	1731	75	44.13	35.96	1470	103
CFC 1400	1105	22	39.68	25.78	1470	99
	1381	30	44.37	28.82	1470	101
	1543	37	46.9	30.47	1470	101
	2236	75	56.45	36.67	1470	104
	2438	90	58.94	38.29	1470	105
CFC 1600	2052	55	61.81	30.74	1470	105
	2653	75	70.28	34.95	1470	106
	2870	90	73.1	36.36	1470	106

The above mentioned value related to unidirectional jet fans.

For reversible jet fans will give approximately 5% lower thrust than those shown in the table.

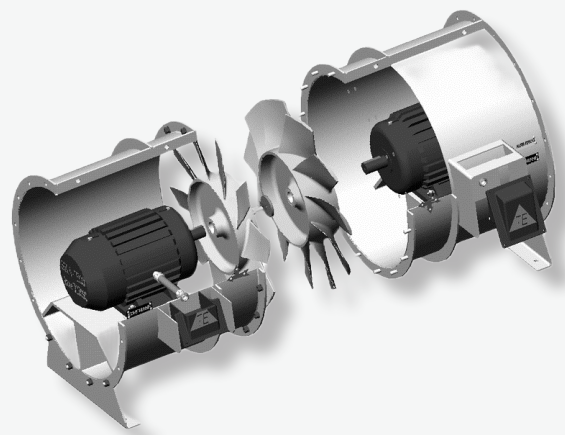
Working Principle

Systems using Novenco tunnel fans employ the jet principle to push air through the tunnel from intake to exhaust. The air is moved by impulses injected by a sufficient number of tunnel fans mounted in the ceiling.

Tunnel fans function by sucking a small part of air in and expelling it with high speed. The ambient air is thereby set in motion.

LARAG AXIAL FLOW FANS (AXF SERIES)

- Blades and hub are made of cast aluminum, dynamically balanced
- Aerofoil impeller with adjustable pitch angle
- Double-stage (impellers) axial fan in counter-rotating design (i.e. spin in opposite directions).
- Unidirectional or Reversible blade.
- Installation in a horizontal and vertical position
- Connection flange and mounting feet.
- Efficient IEC standard motor, efficiency class IE2 or IE3, frequency controllable.
- Degree of protection IP 55, insulation class F.
- Terminal box mounted at the outside of casing for easy wiring.
- Mounting support included.
- Sizes up to 3000 mm diameter



SPECIAL EXECUTIONS

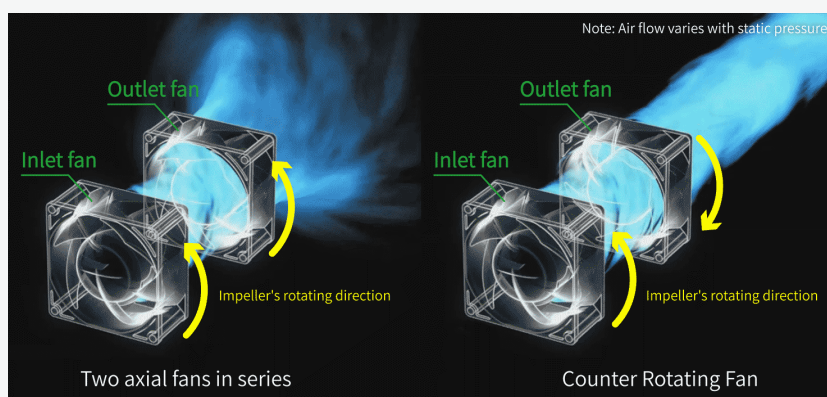
- Apply to smoke, fire and other hot sources with working temperature 300°C or 400°C/ 120 min
- Painting in a color other than the standard.
- Galvanized steel sheet housing.
- Housing made of stainless steel.
- Housing made of acid-proof steel.
- Motor for other than standard voltage and power frequency.
- Engine with a different degree of protection.
- Motor with a different insulation class.



Working Principle

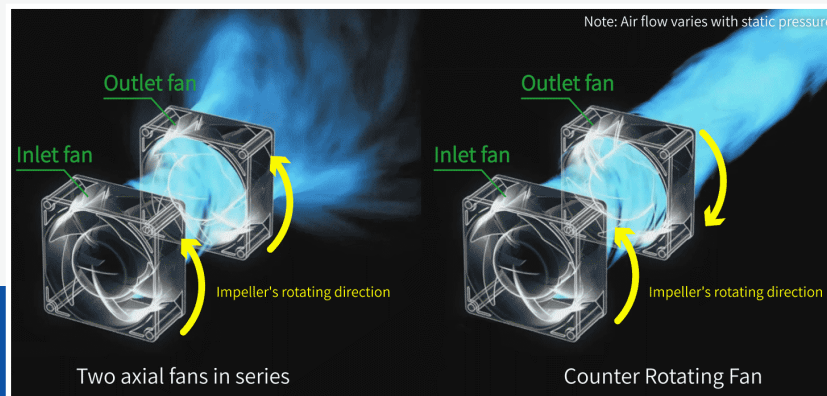
A Counter Rotating Fan appears to be two axial fans connected in series one of these fans on the intake side the inlet fan and the one on the exhaust side the outlet fan. The inlet and outlet impellers have different numbers of blades and spin in opposite directions (The first impeller rotates clockwise, and the second impeller rotates counterclockwise).

After the first impeller achieves the maximum pressure, it directly enters the second impeller in work that causes increasing in the energy of the airflow. Although a counter rotating fan appears to be a combination of two of the same axial fans in series, merely operating two of the same fans in series cannot provide the same performance as a counter rotating fan.



When two axial fans rotating in the same direction are operated in series, the outlet fan further swirls the swirling wind from the inlet fan, generating a spreading flow of air.

However, a Counter Rotating Fan's outlet fan rotating in the opposite direction weakens the swirling components of the wind from the inlet fan, generating a straight air flow and the noise is also reduced.



Because of the difference in the air flow within the fan, a Counter Rotating Fan has a much higher static pressure than two axial fans rotating in the same direction in series.

The performance of the fan as two separate stages is much poorer than that of the two stages operating as a single integral unit and also the performance of the two stages give 2.7 times pressure development of a big single stage fan.

Also, these fans technology cannot be split into their two components and operated as two identical single-stage fans.

TECHNICAL CHARACTERISTICS

Model	Diameter	Max Air Flow	Max Pressure	Motor Speed	Voltage/ Frequency	Power	Article Number
	mm	m3/hr	Pa	rpm	V/Hz	KW	
AXF 800 D4 T01	800	710	1600	1480	380 V 60 HZ	2X7.5	2234401
AXF 800 D4 T02	800	820	2240	1480	380 V 60 HZ	2X11	2234402
AXF 900 D4 T01	900	927	1834	1480	380 V 60 HZ	2X15	2234403
AXF 900 D4 T02,	900	1090	2830	1480	380 V 60 HZ	2X22	2234404
AXF 900 D4 T03	900	1325	3200	1480	380 V 60 HZ	2X30	2234405
AXF 1000 D4 T01	1000	1500	3500	1480	380 V 60 HZ	2X37	2234406
AXF 1000 D4 T02	1000	1736	3859	1480	380 V 60 HZ	2X45	2234407
AXF 1120 D4 T01	1120	1985	4150	1480	380 V 60 HZ	2X55	2234408
AXF 1120 D4 T02	1120	2281	4628	1480	380 V 60 HZ	2X75	2234409
AXF 1250 D4 T01	1250	2912	5355	1480	380 V 60 HZ	2X110	2234410
AXF 1250 D4 T02	1250	3300	5920	1480	380 V 60 HZ	2X132	2234411
AXF 1400 D4 T01	1400	4116	6860	1480	380 V 60 HZ	2X160	2234412
AXF 1400 D6 T01	1400	2725	3100	980	380 V 60 HZ	2X75	2234413
AXF 1500 D6 T01	1500	3352	3559	980	380 V 60 HZ	2X90	2234414
AXF 1600 D6 T01	1600	4068	4049	980	380 V 60 HZ	2X110	2234415
AXF 1700 D6 T01	1700	4879	4571	980	380 V 60 HZ	2X160	2234416
AXF 1800 D6 T01	1800	5792	5124	980	380 V 60 HZ	2X200	2234417
AXF 1900 D6 T01	1900	6175	5412	980	380 V 60 HZ	2X220	2234418
AXF 2000 D6 T01	2000	6684	5820	980	380 V 60 HZ	2X250	2234419
AXF 2200 D6 T01	2200	8020	6926	980	380 V 60 HZ	2X315	2234420
AXF 2400 D6 T01	2400	9550	8173	980	380 V 60 HZ	2X355	2234421

VFD ROLE IN TUNNEL VENTILATION

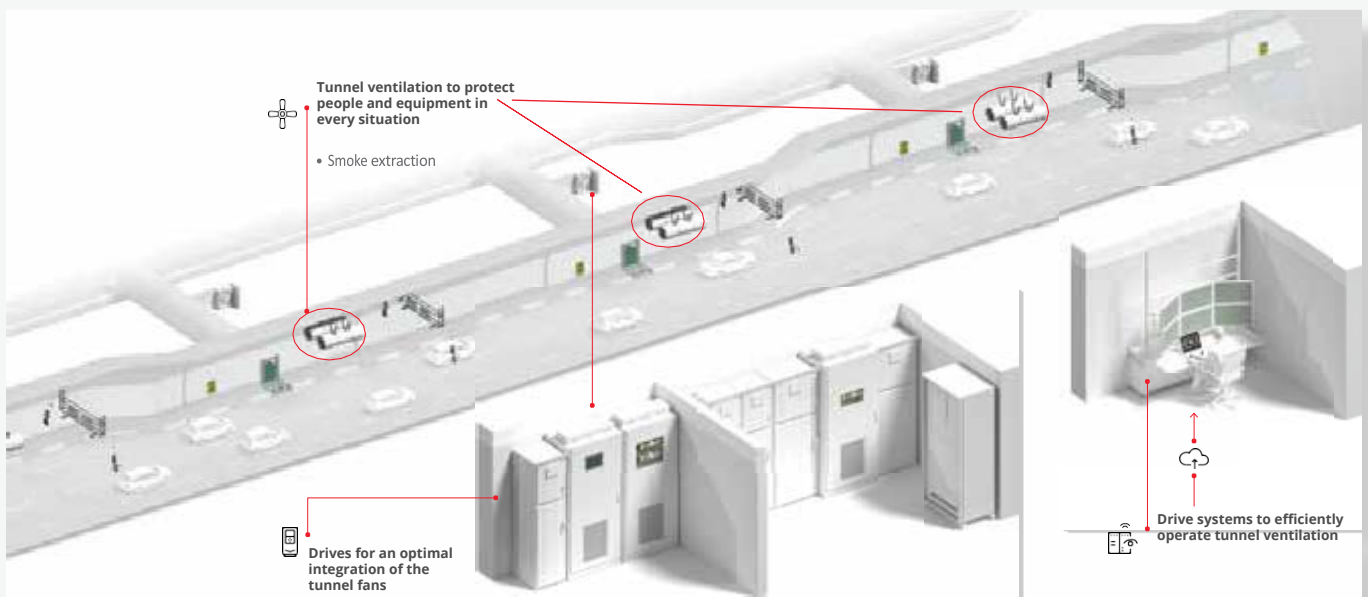
The variable frequency drive (VFD) controls the fan motor running achieve the effective control of the tunnel ventilation fans as follows:

The variable frequency drive (VFD) controls the fan motor running achieve the effective control of the tunnel ventilation fans as follows:

Has a very significant impact on energy consumption. Very small speed changes can yield large energy savings – a speed reduction of 10% results in a 27% energy saving.

Reducing fan speeds can also reduce noise levels – reducing the speed by only 20% will reduce sound pressure by more than 50%.

Helps in evacuation and fire suppression promptly changing fan speed and rotation direction according to a need.



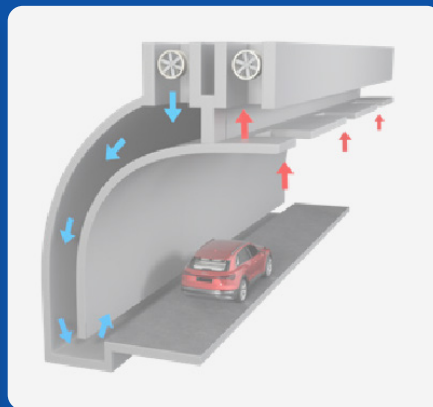
TUNNEL VENTILATION SYSTEMS

Ventilation systems may be configured based on different key elements such as the type of tunnel, length, slope or traffic volume:

LONGITUDINAL VENTILATION



TRANSVERSE VENTILATION

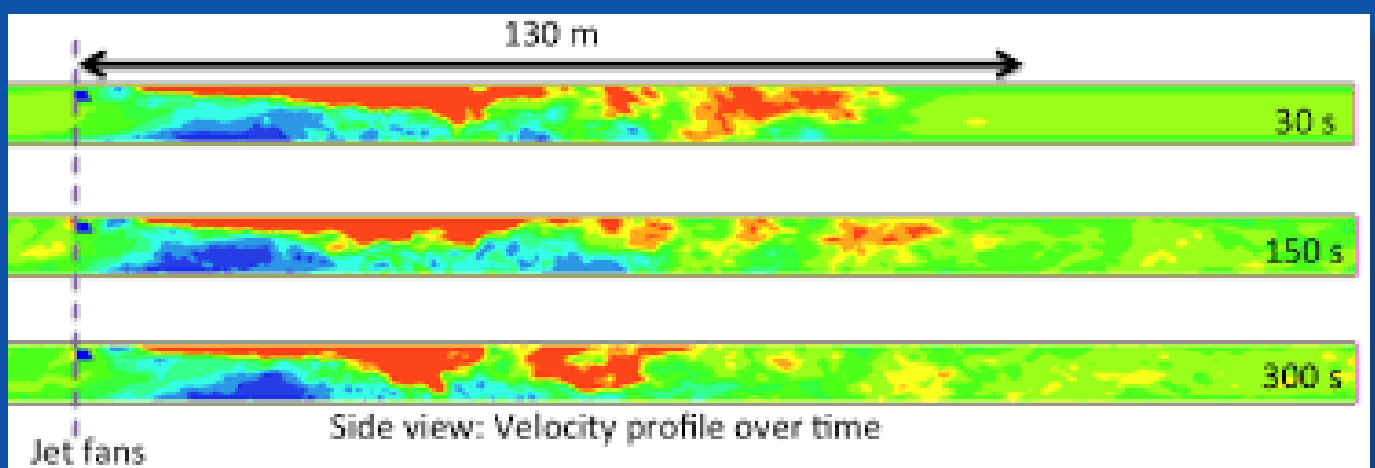
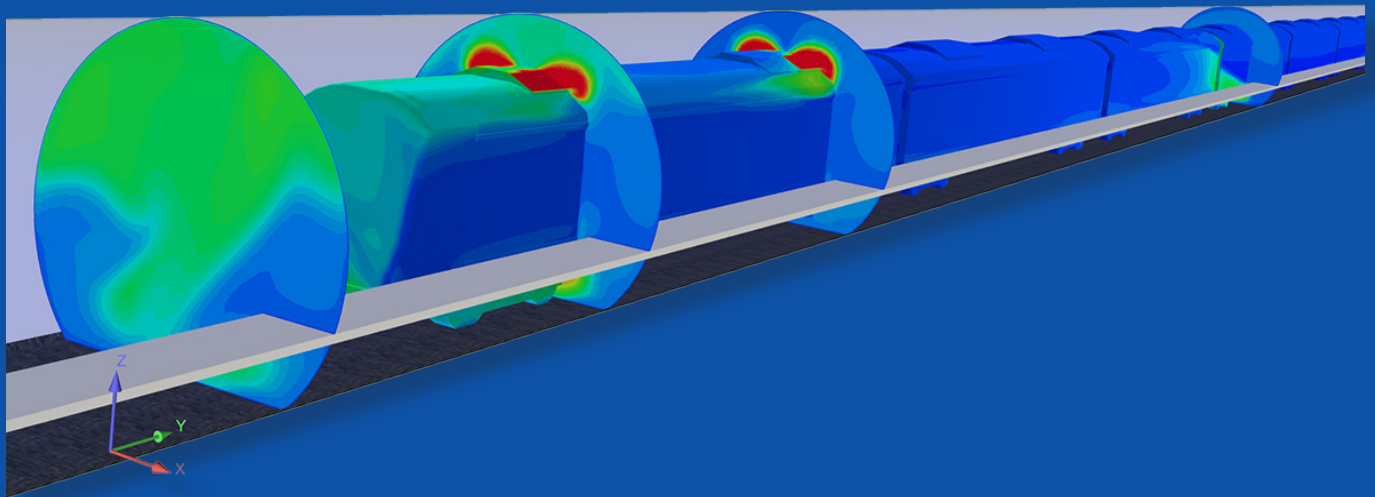


SEMI-TRANSVERSE VENTILATION



CFD APPLICATIONS IN TUNNEL VENTILATION ANALYSIS


Falvent use the CFD simulations for predicting ventilation effectiveness inside underground tunnels. CFD analysis can help to simulate various design configurations and situations thereby verifying the performance of the installed systems virtually and the using CFD modelling to rapidly provide with accurate simulation results for various design scenarios as well as CFD allows to cut significant costs on testing and faster project delivery.






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