

WITT & SOHN

IGW Ventilatoren

Jet fans



**Ventilation
systems**

**Jet fan
design**

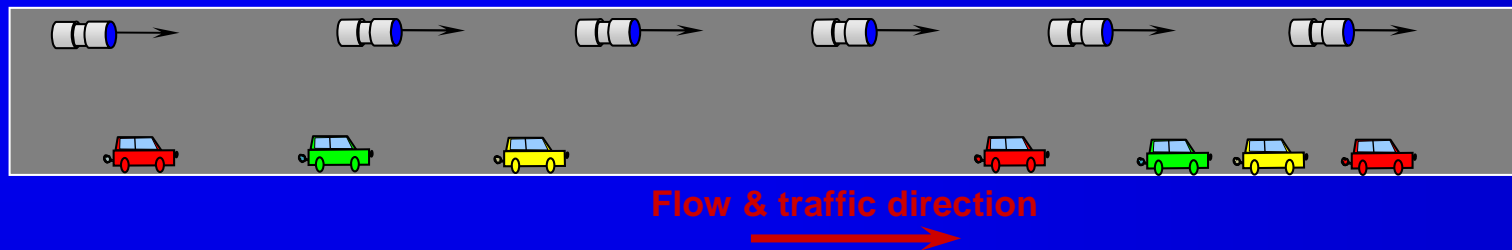


Ventilation systems, solutions

- ❖ Longitudinal ventilation with jet fans
- ❖ Longitudinal ventilation + central stacks
- ❖ Longitudinal ventilation with jet fans + spot exhaust



Longitudinal ventilation with jet fans



Use: tunnel with unidirectional traffic, length up till ~ 3500m depending on traffic load, air speed < 10 m/s

Advantage	Disadvantage
<p>Low costs,</p> <ul style="list-style-type: none"> ➤ No additional shafts ➤ No additional vent-stations ➤ No additional dampers 	<ul style="list-style-type: none"> ▪ Toxic concentration increases towards the portal => limitation by tunnel length and traffic ▪ Fire in case of traffic jam => smoke would be directed towards cars standing in the tunnel ▪ High pollution in the area of the exit portal.

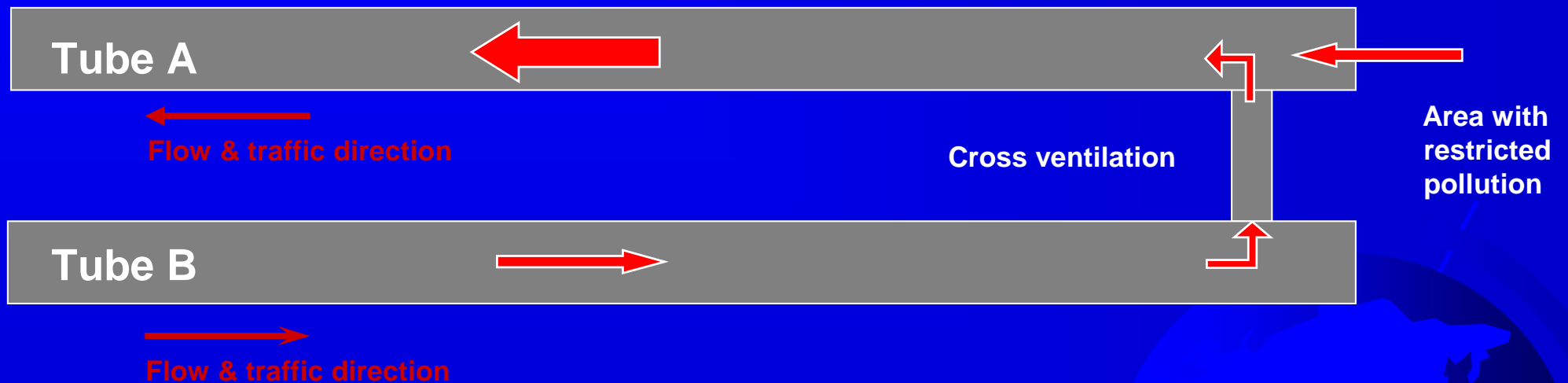
Longitudinal ventilation with jet fans

How to compensate disadvantages?

Disadvantage	Compensation
<ul style="list-style-type: none">▪ Toxic concentration increases towards the portal => limitation by tunnel length and traffic	<p>Selection of another ventilation system => use of ventilation stacks</p>
<ul style="list-style-type: none">▪ Fire in case of traffic jam => smoke would be directed towards cars standing in the tunnel	<p>a) Selection of another ventilation system => supplement of spot exhaust system with smoke duct, dampers and exhaust fans</p> <p>b) Intelligent traffic control in order to avoid traffic jams in the tunnel.</p>
<ul style="list-style-type: none">▪ High pollution in the area of the exit portal.	<p>a) Selection of another ventilation system => supplement of ventilation stacks</p> <p>b) If only one portal would be critical, a cross ventilation could direct the polluted air to the other tube</p>

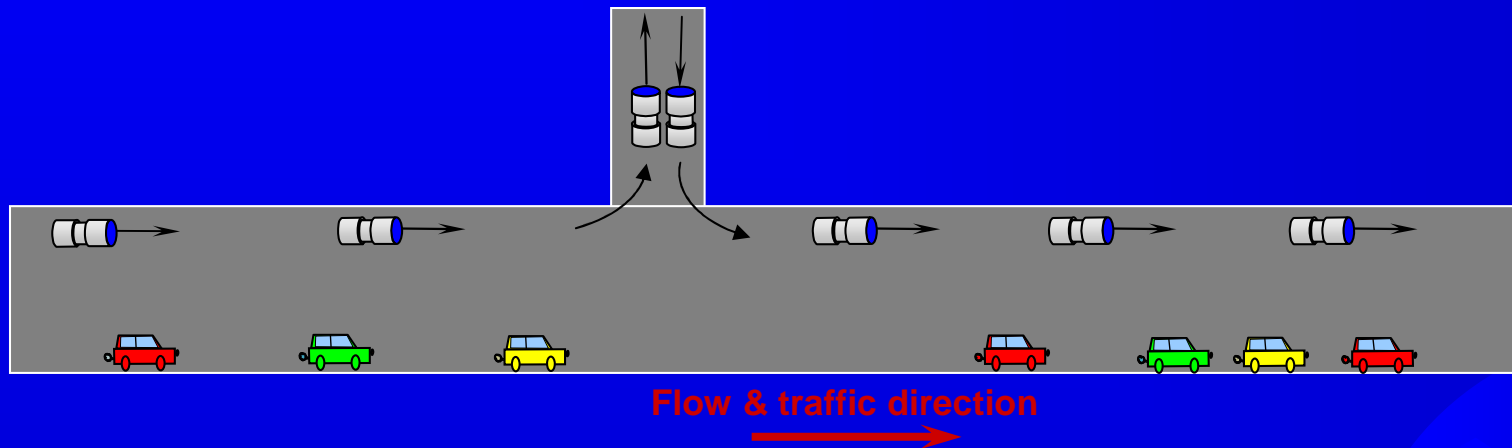
Longitudinal ventilation with jet fans

Principle of a cross ventilation



Polluted air would be partial polluted
from Tube B into Tube A
=> amount of fan has to be increased for tube A

Longitudinal ventilation with jet fans + central stacks



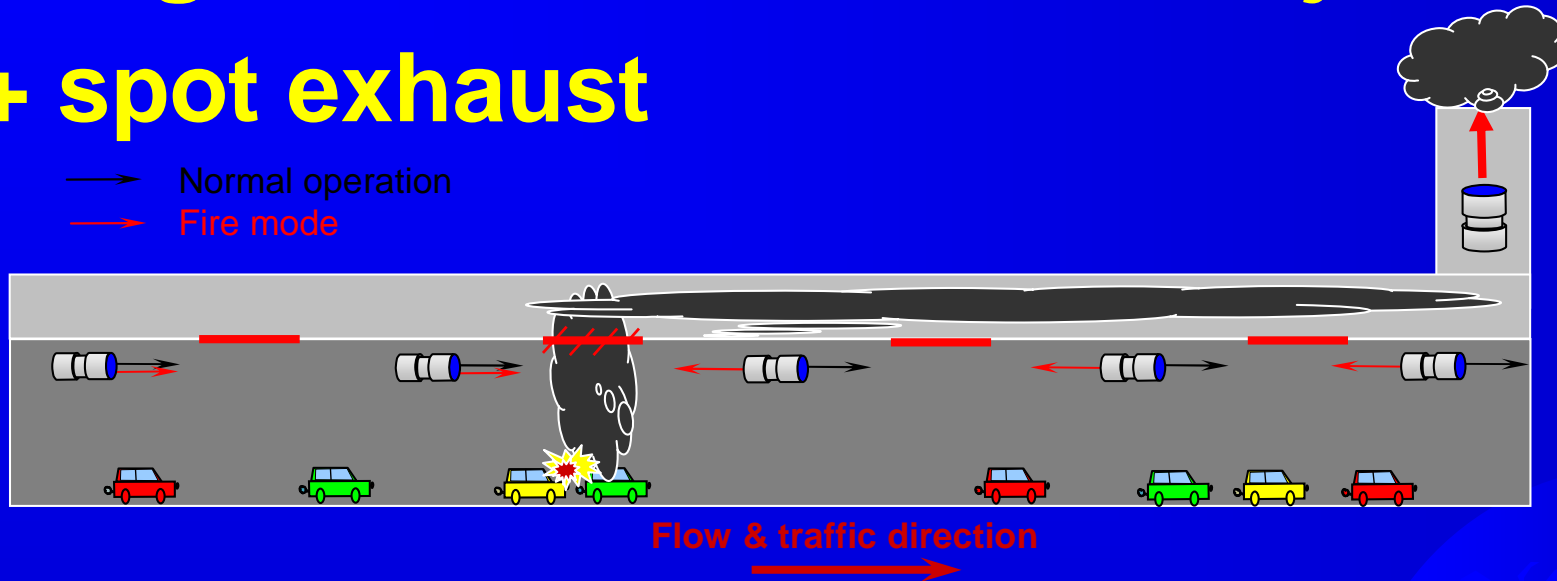
Advantage

Air exchange inside the tunnel
=> limitation of toxic concentration
=> reduced pollution at the portals

Disadvantage

Fire in case of traffic jam
=> smoke still would be directed towards
cars standing in the tunnel
▪ High costs for stacks and vent-stations

Longitudinal ventilation with jet fans + spot exhaust



Advantage

Exhaust capacity could be concentrated on the area of the fire
=> tunnel won't be filled with smoke
=> high safety level

Disadvantage

- Very high costs for smoke ducts, dampers, stacks and vent-stations

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SECTION's END



Jet fan Design, recommended features

- ◆ Truly Reversible design
 - to build up counter pressure
- ◆ Temperature resistant (min. 250°C/1h, better 400°C/ 2h)
 - certified acc. to EN12101-3
- ◆ Sturdy design for long lifetime
 - casing thickness min. 6 mm
 - reliable motor suppliers (SIEMENS / ABB e.g)
- ◆ Corrosion resistant
 - seawater resistant impellers
 - hot dip galvanized casings + high quality paint



Jet fan Design

- ◆ Standard Jet Fan by competitors
- ◆ BANANA JET[®] Fan by **WITT & SOHN**
- ◆ High efficiency fan by **WITT & SOHN**

Fan selection in order to find the optimum solution for

- Invest costs
- Lifetime costs
- Liability



Standard Jet Fan

Traditional way for longitudinal ventilation system since 1960



Characteristics	Special benefit
<ul style="list-style-type: none">• Truly reversible design• Silencers at both ends in order to limit the noise• Thrust reduction by installation close to the ceiling, installation factor has to be considered	- none -

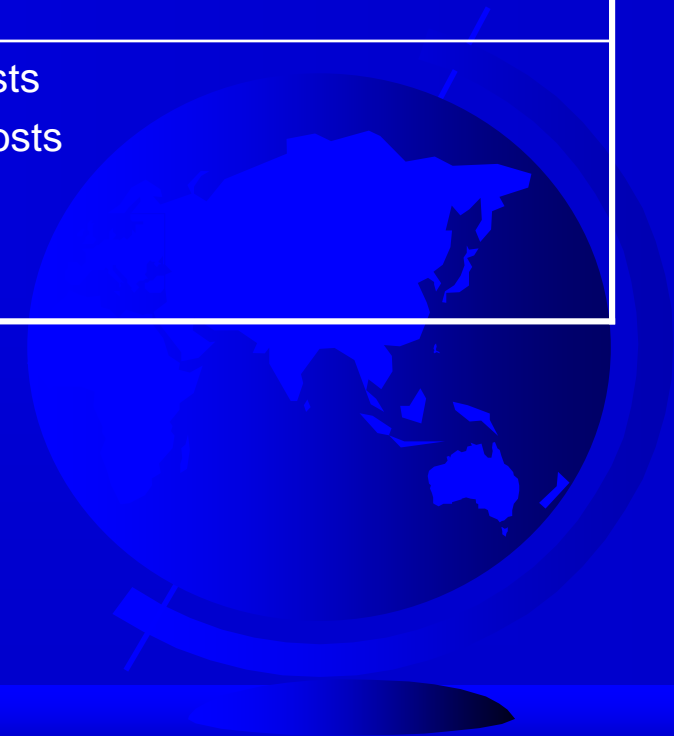


BANANA JET[®] Fan

Optimised solution by **WITT & SOHN** basing on traditional jet fans in order to increase the efficiency in the tunnel



Characteristics	Special benefit
<ul style="list-style-type: none">• Truly reversible design• Banded Silencers at both ends => no thrust reduction by installation => less background velocity losses	<ul style="list-style-type: none">• Reduced invest costs• Reduced lifetime costs

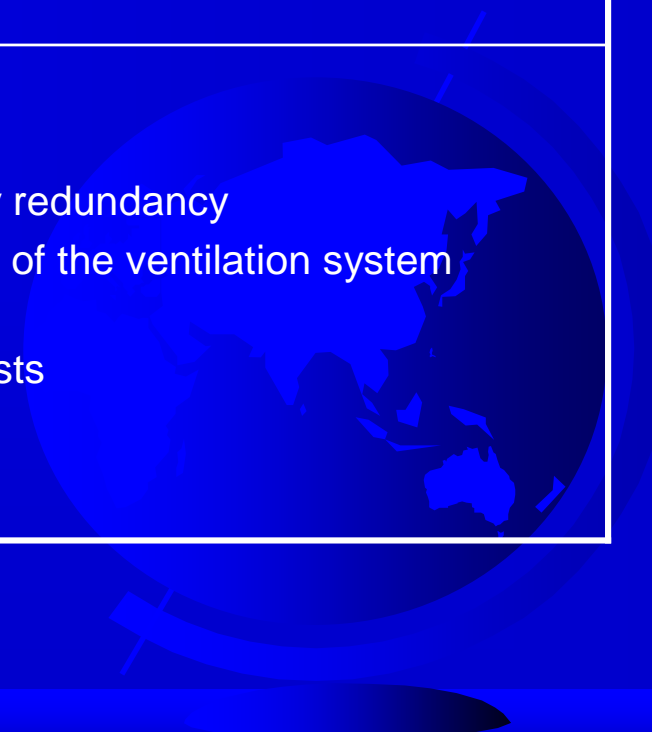


High efficiency Fan

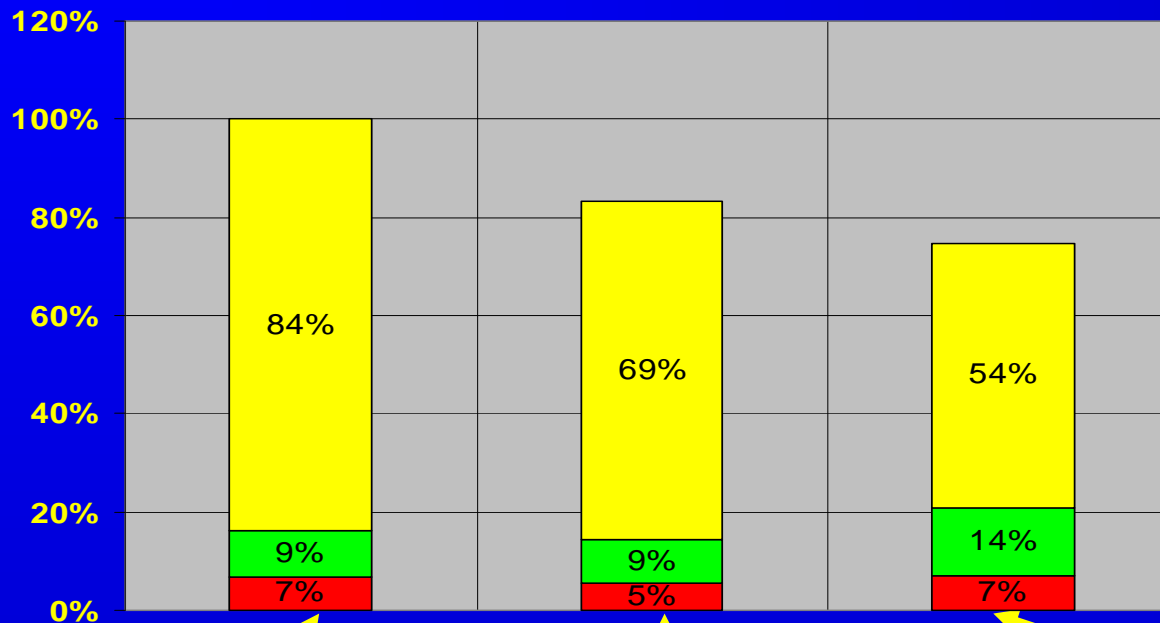
Optimised solution by **WITT & SOHN** for low lifecycle costs, especially for urban tunnels with



Characteristics	Special benefit
<ul style="list-style-type: none">• Truly reversible design• Medium thrust fans with high efficient impellers• Low noise levels => silencers are not required• Guide vanes in order to reduce the installation factors	<ul style="list-style-type: none">• Easy to install• Easy to maintain• Increased safety by redundancy• Accurate regulation of the ventilation system without VSD• very low lifetime costs



Cost overview, life cycle 20 years



- Operation cost for 20 years
- Cost for cables
- Cost for fans



WITT & SOHN recommendation

Use of high efficiency fans

- **Solution with highest liability**
Higher invest costs but
- **Paybacktime**
 - **21 months compared to Standard Jet Fans**
 - **58 months compared to BANANA-JET fans**



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THE END

