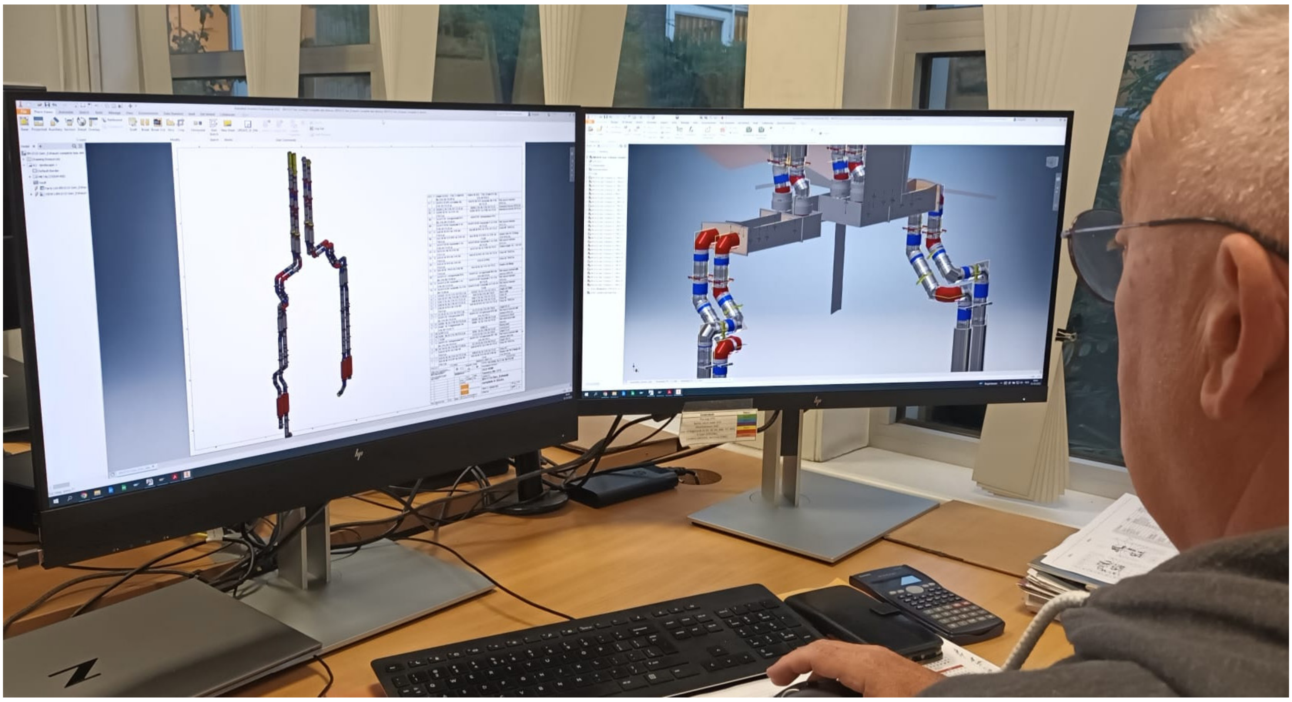
SCHIEDEL METALOTERM



Schiedel Center of Engineering

Engineering Solutions & Project management
of:
Exhaust, Chimney, Sound Pressure Reduction, CLV Systems
for Power, HVAC, Food, Marine and Industrial applications.

www.metaloterm.com

Introduction to Schiedel Metaloterm CoE

Schiedel Metaloterm Center of Engineering (CoE) specializes in **consultancy, engineering, commissioning and project management** of:

- Industrial exhausts and chimneys
- Sound Pressure Reduction Systems (Silencer)
- Cascade flue gas systems & CLV systems*
- Associated mechanical constructions

Our services help our customers to reduce financial, operational and safety risks in flue gas installations in their projects. Designing and building modular exhaust systems and CLV systems which fit the tailormade needs of our customers is our core business. Companies responsible for the construction of factories, superyachts, hospitals, office buildings and apartments, all face similar issues when it comes to managing the installation for exhaust systems, and rely on our CoE services to successfully manage their exhaust projects.

Specialities

- Sound Pressure (reduction) Calculations
- Wind load calculations
- Back pressure calculations
- Structural integrity calculations
- Seismic calculations
- Norms & Regulations conformity checks
- 2D / 3D Drawings & Models
- Heat recovery calculations
- Temperature calculations (Outer wall & Heat flux)

Services

- Feasibility Study & Full design
- Commercial & Technical Quotations & Offers
- Project Management & Commissioning
- On Site Supervision
- Transportation / Delivery
- In-house & On site training
- Sub-contractor selection (Installer / Metal work / Structure manufacturer)
- Industrial Survey & Maintenance (management)

Designed for Safety

Designing the best solution by carrying out structural, acoustic and thermal calculations. Eventually every product design focusses on imaximizing the safety provided by the flue gas systems.

Quality Manufacturing

Our modular components are internationally recognised for their unequaled dimensional accuracy and superior mechanical robustness ensuring a long lifespan. Safety of use is the result of the design of the lock fittings ensuring high pressure tightness of the entire exhaust channel.

Our product quality and service level is embedded in our manufacturing process. Our production processes are equiped with state of the art machinery controlled by the most advanced MRP planning & scheduling system, synchronising manufacturing with the corresponding phase of the project delivery schedule.

In order to ensure product quality and safety all our products are complying with industry standards and norms, international safety regulations and the environment:

- EN 13084 Free-standing Chimneys
- EN 1090 Fabrication & Assembly of steel and aluminium structures
- EN 1856 Chimneys - Requirements for metal chimneys
- EN 1993 (Eurocodes) Design of steel structures
- ASME American society of mechanical engineers
- GB 50051 (Chinese National Standard) Design of Chimneys
- ISO 9001 Quality management system
- ISO 14001 Environment management system

In addition to managing operational excellence we actively contribute to EU standardization, and regularly perform testing on various areas (mechanical, thermal, aeraulic, combustion, acoustic, ...) in our laboratory facilities.

Installation

Apart from delivering our products to project locations across the world, we provide installation services through our selected installation partners.

To ensure our flue gas systems are installed correctly by third party installation companies, we provide on site supervision service, as well as support in sub-contractor selection, training and supply of extensive installation documentation.

Flue gas Engineering

The installation of Flue gas systems, Engine exhausts, Chimneys, CLV systems and Silencers often pose serious financial risks due to their phase in a project, and usually, their position on the **critical path**** of that project.

In order to manage projects successfully and economically, it is essential and imperative to be able to minimize or eliminate project risks. Commercial and industrial HVAC, flue gas and silencer projects require in depth knowledge and close monitoring througout all the project phases in order to eliminate project risks.

Industrial, Commercial, Marine and Residential projects each require a custom approach. From stylish stoves to high efficiency boiler cascade systems and high power diesel engines.

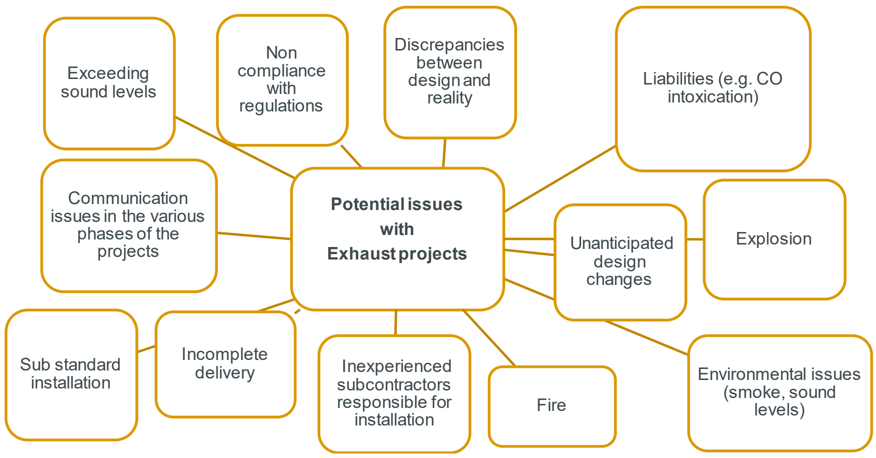
Knowing exactly how to engineer an exhaust system and install it complying with legal regulations is key to how the CoE of Schiedel guarantees a successful exhaust project.

* CLV system: combined flue exhaust and air intake system
** Critical path: see page 4

Risks related to the installation of exhaust systems

The installation of an exhaust system requires knowledge about a variety of topics. Next to the expected knowledge about regulations and how to manage the project within timeline deadlines, additional expertise is required to avoid issues related to installation of exhaust systems.

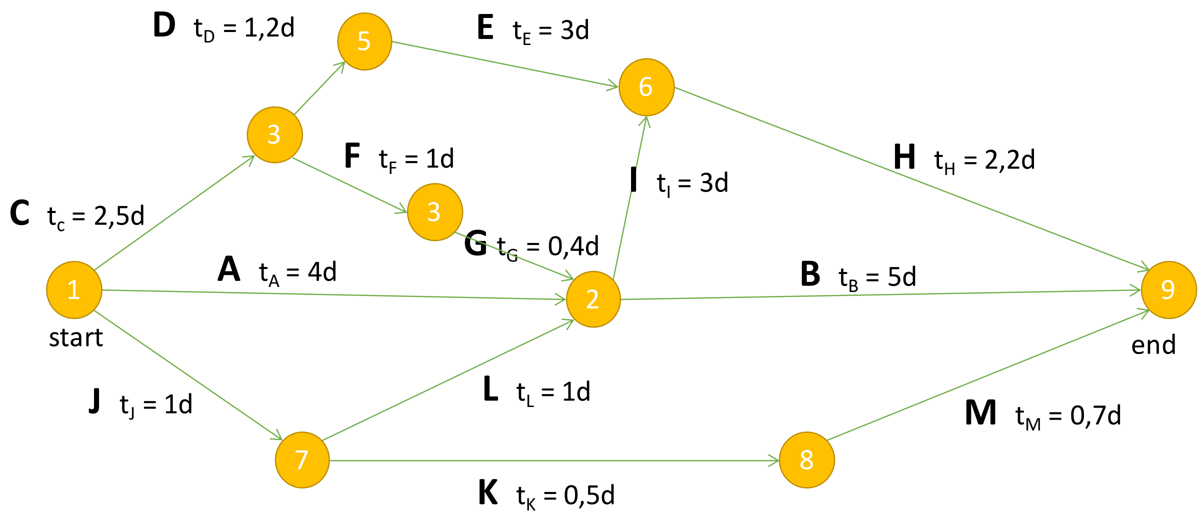
Each of these issues potentially create risks for the contractor



That much is clear: the exhaust design and installation requires specialistic attention. A specialized engineer for exhaust systems has a broad knowledge about several types of calculations. For example, seismic and wind load calculations or calculations involving the physics behind the exhaust system such as back pressure calculations and structural integrity calculations. A successful exhaust system installation project requires proper design, both in engineering as well as in timing of the delivery and installation. This is essential to avoid delays on **the critical path** of the project.

CRITICAL PATH METHOD

In order to manage complex industrial projects, **the critical path method (CPM) is widely accepted** as the most effective way to ensure timely and correct finalisation of a project. A simplified explanation of the CPM is shown in the diagram below:



The minimum time required to complete this project is determined by activities A and B (4 + 5 = 9 days). The critical path is formed by connecting nodes 1 (project start), 2 and 9 (project end) via activities A and B. All other activity routes from node 1 to node 9 require less than 9 days to complete. Delays on activities A and B cause the project to be finished later than planned. Delays on other routes can change the critical path structure: if for instance one or more activities on route 1 → 3 → 5 → 6 → 9 are delayed with more than 0,1 days; then this route will become the critical path and inevitably cause a project delay.

- Arrows indicate activities
- Times per arrow minimum time required to complete an activity (t in days).

Working with CoE guarantees that your (sub)project such as the installation of an exhaust channel and/or sound pressure reduction system will not affect the critical path structure of your project planning.

Project risks (Financial impact)

Project risks associated with completion of partial / sub projects located on the critical path. For instance: HVAC / GenSet / Power projects, tailor made flue gas channels, engine exhausts, silencers, etc.

Risks find their origin in a myriad of root causes:

- Incomplete system definition
- Poor engineering
- Inadequate project preparation & planning
- Overstressed project management
- Unexpected setbacks in execution & installation

Resulting in exposure to additional cost categories: a non exhaustive list of examples:

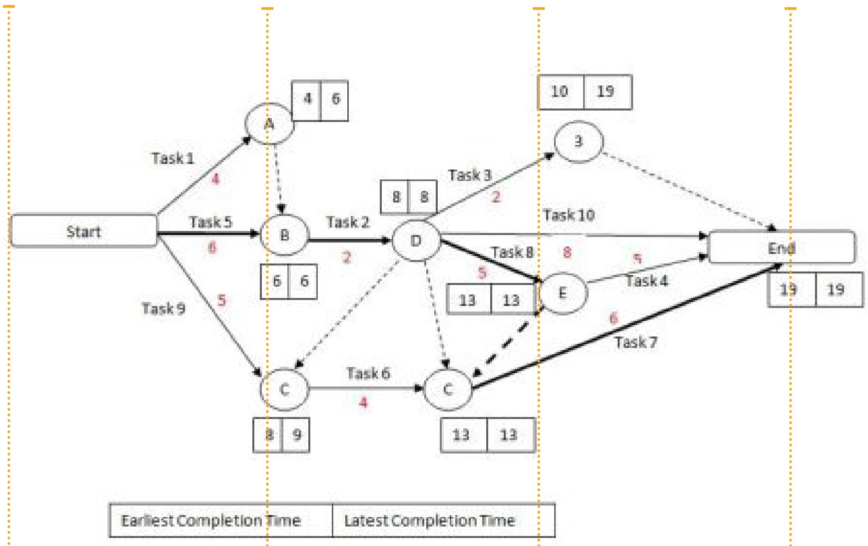
1. Penalties of late delivery
2. Delayed payments (costs of debt collection)
3. Unanticipated cost of corrections during the completion of the project
4. Cost of corrections and repairs after failing the site acceptance tests or occuring during normal operation
5. Liability as a result of catastrophic failure (fire, explosion)

Financial impact of risk exposure (to the main contractor): Suppose a HVAC or Genset project with an order value of 2M€ supplied with an exhaust/silencer combination with a purchase price of 35K€ corresponding to the cost categories previously mentioned.

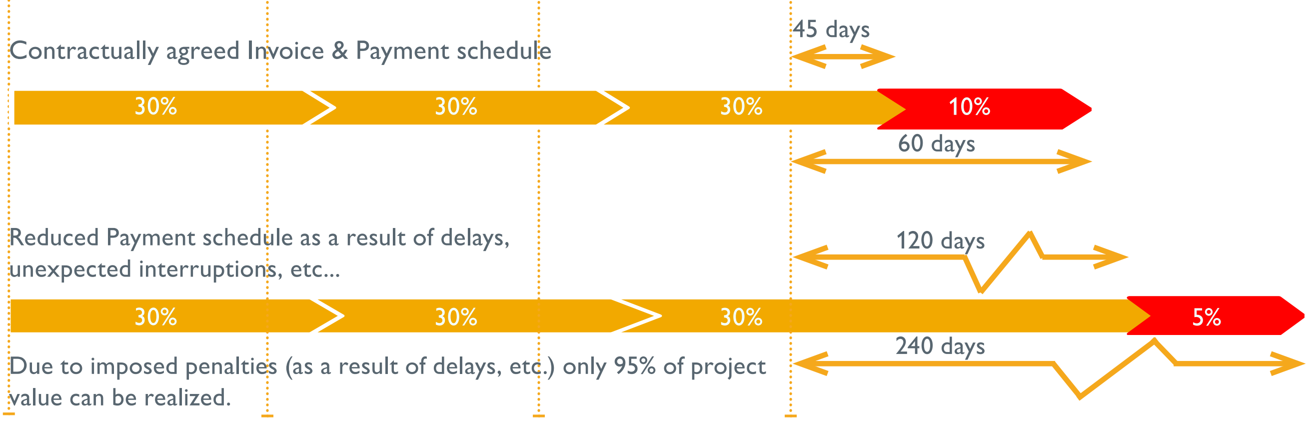
1.	Penalty 5-10% of project value	100	-	200	k€
2.	Cost to settle payment term			...	k€
3.	Correction cost without penalty (1)	10	-	50	k€
4.	Correction cost with penalty (2)	10	-	200	k€
5.	Liabilities (a variety of costs)	0	-	In excess of project value	

The potential financial risks easily exceed the value of the sub project (exhaust / silencer). This depends largely on the location on the critical path of the project. The framed text below goes into more detail.

FINANCIAL IMPACT AS A RESULT OF DELAYS ON THE CRITICAL PATH



- Activities on the critical path are potential delays of the entire project.
- Flue gas systems are on the critical path.
- Flue gas systems represent a relatively small part of the total project value for the customer. For instance a HVAC installer accepts a **2mio€** order, the flue gas system represents **35K€.**
- Delays of the flue gas system, design flaws, etc. cause disproportional large penalties (and exposure to serious liabilities), penalties of **5-10%** (**100-200k€**) are not uncommon.



In this picture: Full service engineering & installation (one-stop-shop)

Maritime

Modular exhaust systems enable low mass solutions for dry exhausts on every type of vessel. The CoE works closely with design teams to come to a finalized design in as few iterations as possible. Our installation crew is available for installation on site, in different phases if required. Alternatively, we offer training for installation by the shipyard's staff, post-installation inspection, and testing. In this way we significantly reduce the risk of problems during HAT/SAT (Harbour/Sea Acceptance Testing), or operations.

Power Generation

To achieve optimal output with generator sets and CHP applications it is of paramount importance to have a carefully engineered discharge of exhaust gases. Our CoE engineers are always contacted after initial concerns about safety and sound level requirements and regulations of generator set installations, for example when hospitals or data centers require tailor-made solutions. To avoid exhaust-related issues entirely it is essential to involve us at an early stage: As a preferred supplier we recognize the logistic and design challenges in exhaust & silencer projects.

In this picture: High pressure system solution (incl. silencers)

In this picture: Turnkey installation at food processor (bakery)

Food

As is with every piece of equipment within a food production facility, proper maintenance and cleaning are critical to uninterrupted operation. Our broad experience helps to avoid critical issues such as: fat & oil deposits in exhausts, silencers or heat exchange systems, improper discharge of volatile organic compounds (VOC), or the unforeseen need for a complete heat exchange process system (or redesign). Schiedel Metaloterm CoE helps customers in the food processing industry (e.g. bakeries, breweries, plantations, etc...) achieve high efficiency levels through short turnaround times and compliance to the latest food safety standards based on HACCP criteria.

Commercial & Utility HVAC

Project managers responsible for commercial or utility construction projects use our engineering services for instance to simplify their HVAC project and guarantee successful completion (new build & renovation). Our standard solutions such as compact and lightweight silencers, the option to add heat exchange systems, and CLV- and cascading flue gas systems greatly help to avoid unplanned additional costs, insufficient system dimensioning or noise nuisance. Schiedel Metaloterm services ensure the custom requirements for the HVAC project are met and completed as planned, every time.

In this picture: Appartement block heating (incl. structural steel)

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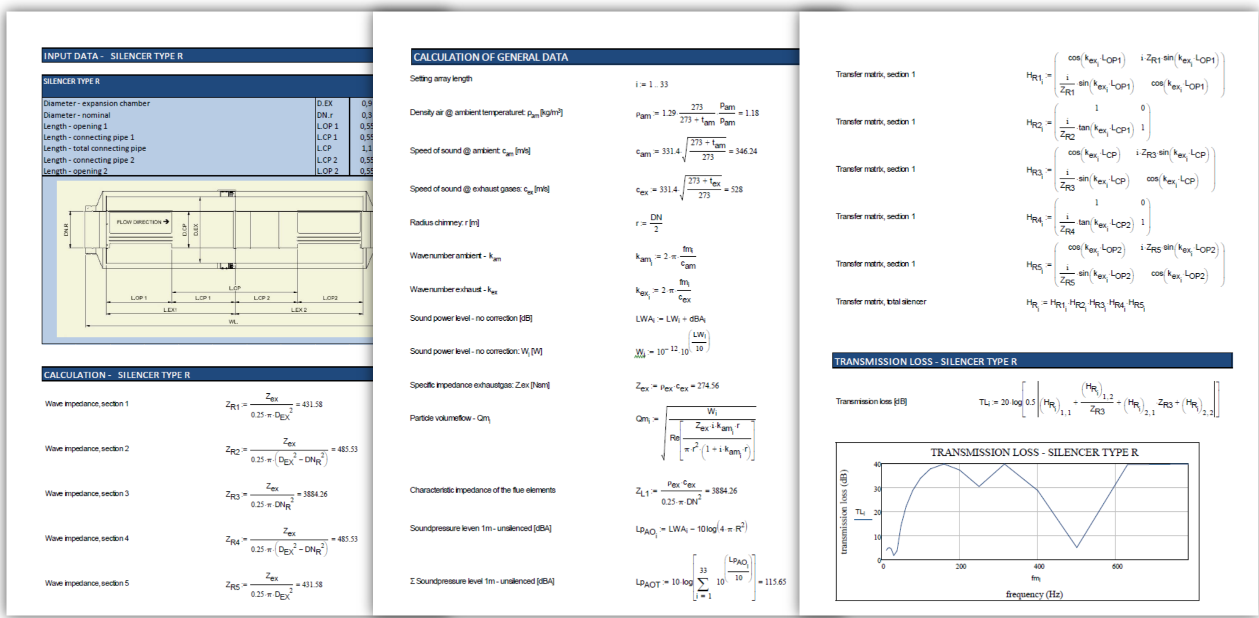
WORLD-CLASS

Schiedel Metaloterm B.V. is a leading manufacturer of high quality modular exhaust systems, flue gas systems, CLV systems and silencers for residential and industrial applications.



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