

Turn sustainable with OTP optimise performances

Powering a sustainable mining future



Matteo Colombo, BU Manager OTP, analyse the deep benefit of the OTP approach for mining industry

The sustainability is a global trend, but what does it really mean and how to apply it to mining?

Application of sustainability principles to mining is challenging for the nature and the type of business itself. However, a sustainable development defined as – meeting present needs without compromising needs of future generations – is increasingly incorporated into mine operation by environmental policy based on clear goals and roadmap supported by a forward-thinking management able to change paradigm and consider sustainability a key element of successful business.

The challenge for OTP is one of the most complex – states Matteo Colombo- to develop technological solutions within an acceptable timeframe that make these achievable without negatively impacting the company's business.

OTP optimise performances: division

OTP optimise performance is a specialised division set up to support mine companies and other industries in identifying the areas for improvement and optimisation of their industrial process with regard to emissions and plant digitisation. The distinctive element is the method, custom and targeted with the goal of bringing systems to those desired performance goals.

Dedusting solutions are commonly focused on the filters only, but often problems starts far away. High dust level, filter and ducting clogging have many causes, and fabric filters may be only marginally involved, that's why it is necessary a full assessment of the system.

Full dust collector project

Recently OTP division has finalised the assessment and optimisation of the **15 dust collectors lines** for a primary mine company. The client highlights the issues below:

- Clogging and high slip of dust all along the process
- Difficulty to stay below the limits imposed by local authorities
- Risk for health and safety of personnel working on the process

the main complain is the high quantity of dust in the working area and exposition of personnel to dust slipped and released in the air. Moreover, the environment impact, the dust slipped and released in the atmosphere has high impact on emissions level. In addition, no 2 lines present higher criticality compared to the others without a clear reason.

The targeted results are:

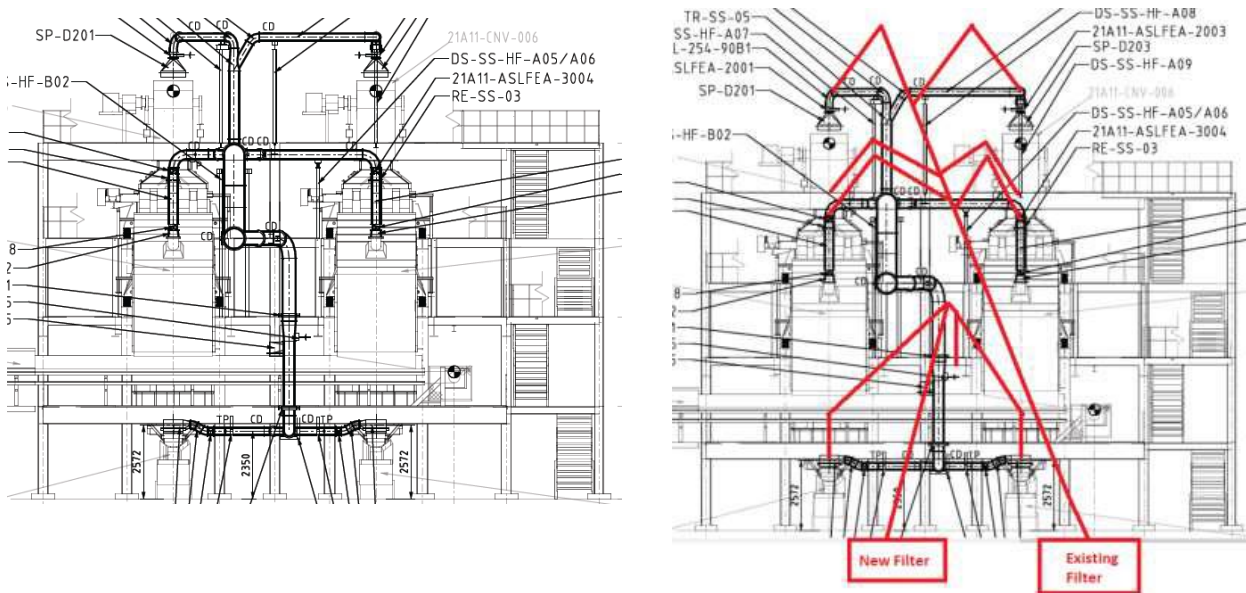
- Eliminate the clogging of dust on the process
- Improve the dedusting action and get an APC system efficient and adequate
- Monitor all filter's parameters and dust collector smooth operation in order to prevent future malfunctioning

First step is the site survey by OTP technical support, to deep assess the existing dedusting system and process. The site survey maps the suction points and highlights that the dust could not be removed by the

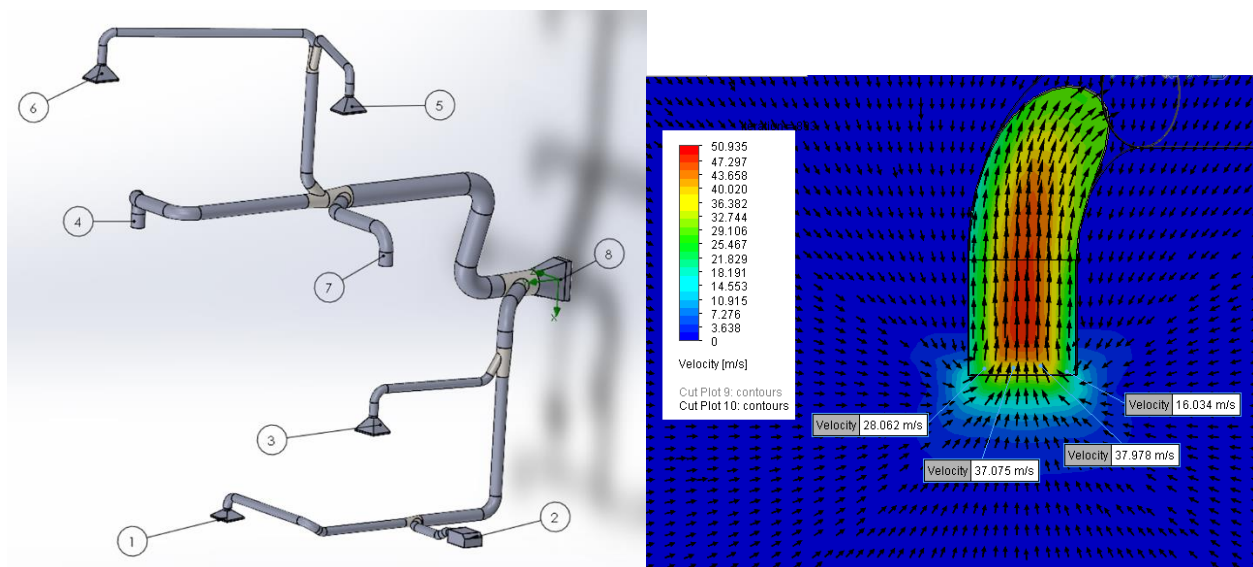
existing equipment. Based on the characteristics of the dust, the requirements of the served machines as well as the layouts aspects, OTP propose a challenging project consisting of the **rerouting of ducts and full review of the engineering design of APC (Air Pollution Control) system.**

The main problem for all the assessed lines was strictly related to the upstream equipment, only 8 lines showed the need to add additional dedusting unit. This means that in 50% of the cases the dust problem is solved thanks to a deep engineering restudy: new geometry of the suction points and ducts rerouting. Feasible thanks to a gap analysis and CFD simulation.

Picture 1 show 2D drawings of the ducts before the re-engineering on left and on right the rerouting of ducts and the new dedusting unit. New duct routing and geometry of hood improve suction capability.

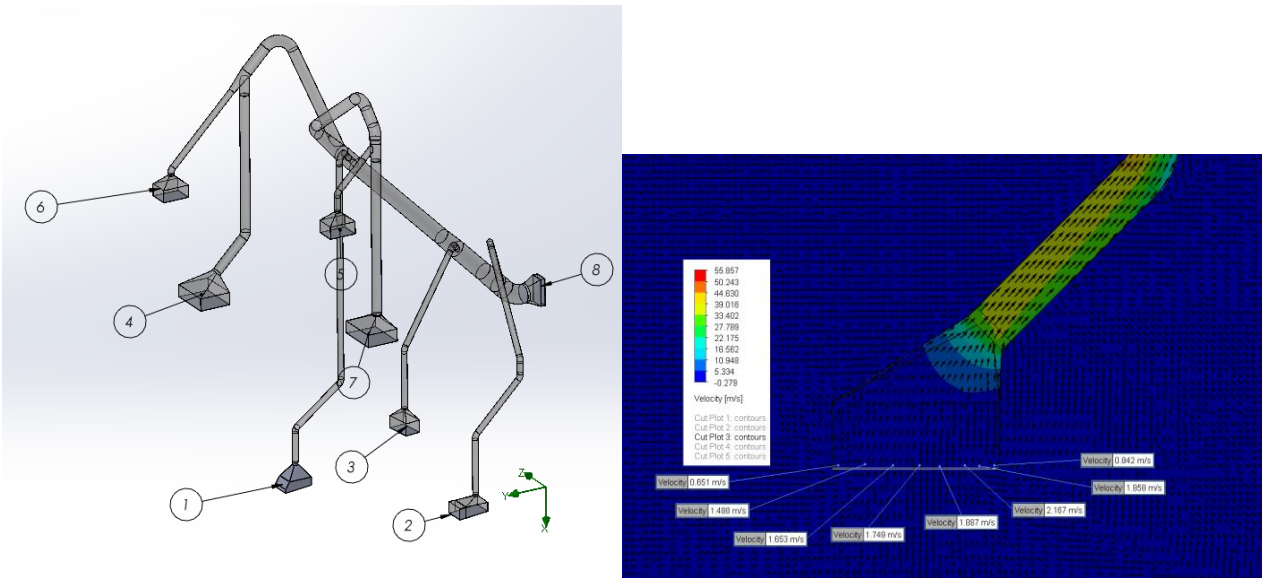


Picture 2 show the 3D drawing of existing ducts, and picture and CFD simulation of gases passing thought the ducts. Some points get more than 2 m/s, others even 4 m/s.



All the hoods changed geometry.

Picture 3 shows the 3d model of the new routing and new geometry of the suction hoods. Total air flow remain the same, but capturing speed is now relaxed.



The larger design for hood and optimisation of all the devices and components of the system allow to relax the capturing speed keeping unchanged the total air flow. The CFD simulation of the optimized solution allow to verify the feasibility of the new geometry and technical calculations.

Focus points of the solution:

- Optimised the capturing speed: monitoring the maximum capturing speed, to avoid draft product
- Keep minimum flow velocity at suction points to reduce the dust load and avoid clogging inside the ducts
- Start / Stop control philosophy
- Advisory and guidelines for proper rubber skirt and enclosure at belt installation

Table 1 and table 2 show the calculations for optimisation of gas flow rate and velocities for hoods and ducts.

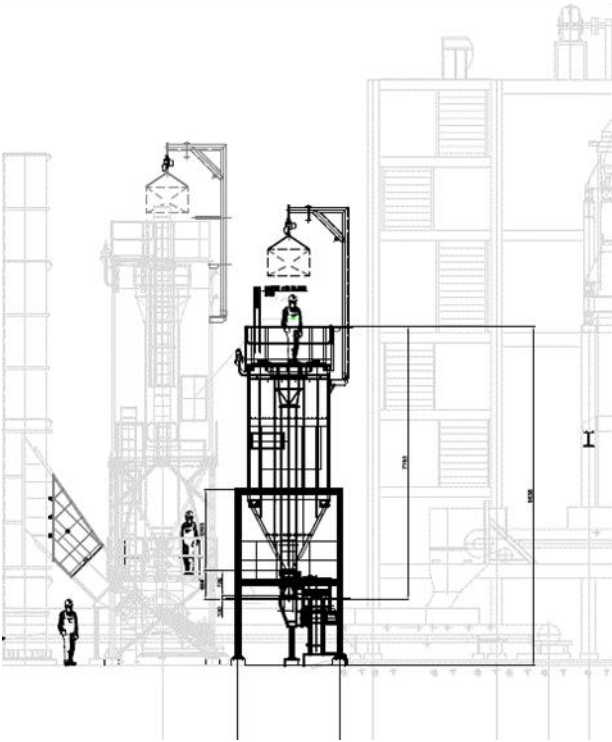
CTP CALCULATED HOODS					
	Hood dimension			Flow rate m3/h	v** m/s
	mm	mm	m2		
1	1200	900	1.080	3500	0.90
2	1200	900	1.080	3500	0.90
3	1500	1200	1.800	5750	0.89
4	1500	1200	1.800	5750	0.89
5	1500	1200	1.800	5750	0.89
6	1500	1200	1.800	5750	0.89
Existing Filter				30000	

CTP CALCULATED DUCTS						
segment	Flow	diam mm	inches	Area m2	velocity m/s	
1	3500	267	10.5	0.0559	17.4	
2	3500	267	10.5	0.0559	17.4	
3	5750	330	13	0.0856	18.7	
4	5750	330	13	0.0856	18.7	
5	5750	330	13	0.0856	18.7	
6	5750	330	13	0.0856	18.7	
1+2	7000	368	14.5	0.1065	18.3	
1+2+3	12750	495	19.5	0.1927	18.4	
1+2+3+4	18500	597	23.5	0.2798	18.4	
1+2+3+4+5	24250	686	27	0.3694	18.2	
Existing Filter		30000	762	30	0.4560	18.3

7	1150	900	1.035	3400	0.91
8	1150	900	1.035	3400	0.91
9	1150	900	1.035	3400	0.91
New filter				10200	

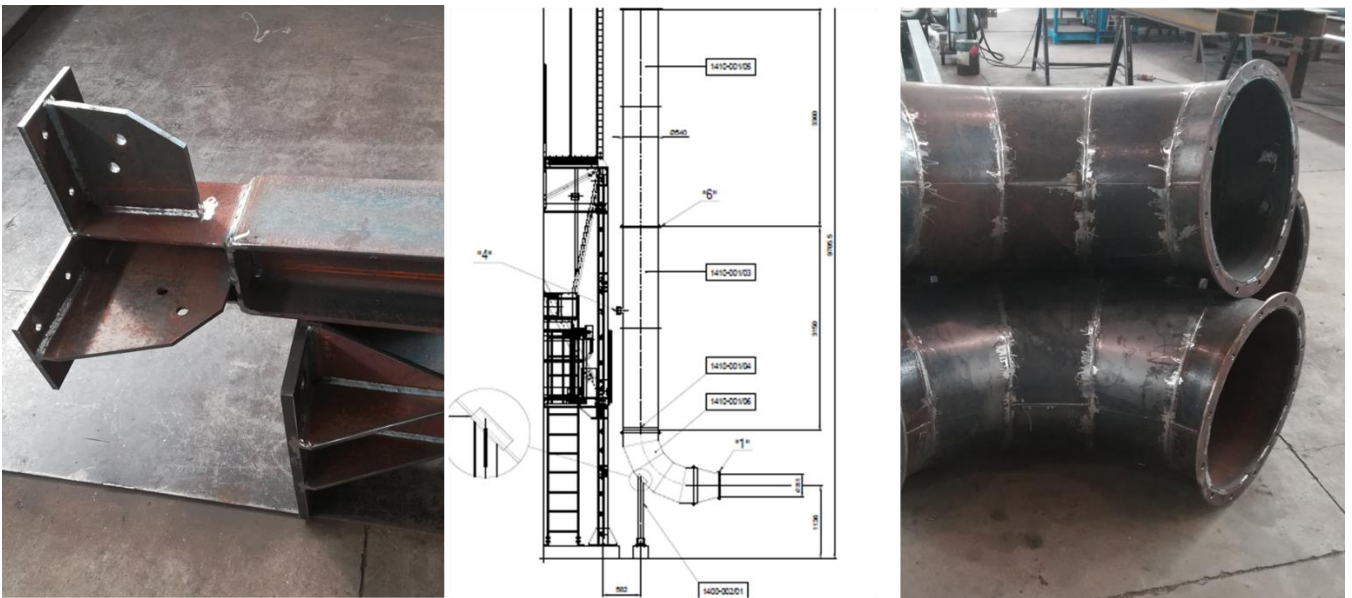
7	3400	254	10	0.0507	18.6	
8	3400	254	10	0.0507	18.6	
9	3400	254	10	0.0507	18.6	
7+8	6800	368	14.5	0.1065	17.7	
New filter		10200	445	17.5	0.1552	18.3

PRELIMINARY POSITION OF NEW FILTER

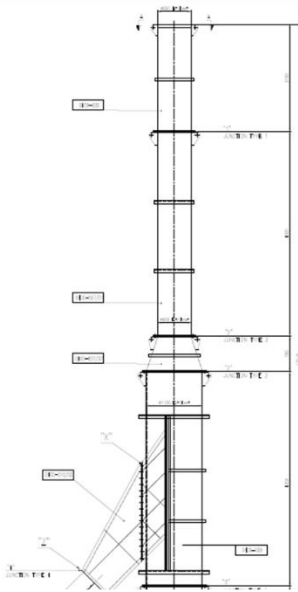


Manufacturing of the steelworks and inspections are carried out **internally** to guarantee the validity of the technical solutions and standards quality agreed with the mine company.

Picture 4 show the welding and steelworks of ducts and support structures.



Picture 5 Inspection quality of stack after painting process



On-site

OTP provides full support during the maintenance procedures. All the machines are equipped with high quality spare parts. Each system is now controlled remotely thanks to the remote monitoring service.

The challenge: balance of suction points

As explain above the rerouting of ducts and the study of the new geometry and the support of the CFD analysis lead the optimisation of the dedusting system. The gap from design to reality is the balancing of the suction points: this criticality is related to that all the suction points connected by one single duct affect each other during the fine tuning of the system. OTP technical support set the shutter's position for the best dedusting result.

The project in short:

- Review of ducts engineering and size of APC system
- CFD study of existing equipment
- New equipment and optimization of existing hoods
- Supply of high quality spare parts
- Maintenance and technical service
- Assistance during commissioning and start-up
- Full system fine tuning
- Plan of preventive maintenance

Picture 6 new routing of duct 45° inclination to avoid the dust clogging

Picture 7 new fabric filter unit on left side to split the suction point and optimise the dedusting system



The optimisation study on each equipment provides its own contribute to the whole project, reaching the targeted results and high level of performances and reliability of the dedusting system. Additional benefits are the reduction of the OPEX linked to sharpened maintenance procedures and spare parts quality, as well as a better management of the equipment after a fine tuning of all the components.

Finally the remote monitoring services allow a drastic reduction in unplanned shutdowns and consequently peak emissions.

This approach allows to select all the possible solution to maintain a satisfactory operation of the mining plant in terms of availability with a significative improvement of the quality of the environment for workers as well as the reduction of pollutant emissions. The optimised solution is designed to meet dust emissions below 10 mg/Nm^3 , during in performance test the equipment registered emissions below 2 mg/Nm^3 .

Often happen that a common technical solution cannot always cover all the requirements, this is the criticality of all the brown fields projects. In this perspective the choice of a partner with internal know how built in many years of activity, make the difference in finding a comprehensive solutions, involving also aspects related to the control and management of the whole installation. Not to exclude in some cases to see also possible application of industry 4.0 technologies.

OTP mission & CTP Team

OTP's mission consists in reach higher performances, reliability and savings and provides technical analyses of the existing scenario, study optimized solutions and suggest the targeted results.

CTP Team is an international engineering and manufacturing company with 50 years of experience. Since 1970 CTP Team is committed to provide innovative solutions to the industrial plant worldwide. The headquarter at "Kilometro Rosso" in Italy is one of the leading innovation districts in the EU and the point of contact for the projects worldwide. The company is organised in 3 business units: Air pollution control (APC) , Waste Heat Recovery (WHR) and OTP optimise performances.