

# Total Solutions

## Hot Topic Hour August 20

Foundation for hot topic hour revised  
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# Overview of Total Solutions

- An air polluter can buy components and design, operate and service his pollution control system
- Alternatively he can outsource all these responsibilities.
- The revenue potential for all this outsourcing is defined as the “Total Solutions Opportunity”
- The historical trend is toward greater and greater outsourcing
- The availability of new digital tools will accelerate this trend in the future
- This opportunity promises to deliver higher profits to suppliers and lower life cycle costs for operators.
- There are many partial solutions as well as total. Each needs to be evaluated.

# Demand Factors for Total Solutions

Factor	example
Complex systems with multiple control steps	Coal fired boilers, cement kilns, chemical processes
Valuable final product recovery	Precious metal mining,
Valuable process product recovery	Refinery catalyst, solvents in chemical and surface treatment
Difficult compliance with air permit	Many industries in many countries where even start up and shut down emissions are important
Safety	Explosive gases
health	Semiconductor toxic fumes
Potential for air pollution control system to negatively impact operations	Many industries
Lack of skilled personnel within the plant	Continuous trend
Success of remote monitoring	Applicable to all pollutants and operating parameters
Ability of suppliers to provide a lower cost alternative	Reduction of repairs, downtime, energy consumption etc

# Total Solution Options

Options	example
Preliminary system design	CECO offers CFD modeling and design for rolling mill fume control including the important industrial ventilation ductwork to reduce air volume
Turnkey system with unique combination of pollution control devices	Megtec sewage sludge incineration systems with oxidizer, scrubber and wet precipitator. Trimer supplies PM 2.5 Nox reduction and acid gas capture in one device
Turnkey system with total operational control	FLS offers this option for cement kilns
System and reagent integration	Durr and ClearChem supply pulverized limestone injection in the furnace followed by a catalytic filter
BOO and by product sales	MET offers this system to convert SO2 to ammonium sulfate fertilizer
Remote monitoring of operations	Many examples
Guaranteed cost bag replacement program	Supplier monitors operations and replaces bags as needed at a fixed yearly cost
Routine service programs	Replace all parts in system, regular inspections, continuous remote monitoring

# Initial analysis by system providers-

Gas Turbine exhaust system (Peerless example)

## Computational Fluid Dynamics (CFD)

- Fluent Software
- Multi-phase Flow Simulations
- Retrofit Design Evaluation
- 20+ years experience

## Air & Water Wind Tunnel

- Performance Confirmation
- Doctorate Level Staff
- 40+ years experience
- Silencer Test System

# Total Solutions- Turnkey Systems

- The owner can design his own system, hire an A/E or ask for turnkey bids
- Turnkey bids result in transfer of responsibility, quick delivery and often lower overall costs
- A/E firms argue that turn key bids often include lower quality components and that the performance of major components should be specified. However, owners who sole source turnkey projects are typically assured that their component expectations will be met.
- The requirements to remove many pollutants in one system combined with the negative impact of one removal device on the capture of other pollutants makes the allocation of total responsibility desirable
  - The choice of catalyst influences SO<sub>3</sub> generation
  - The choice of burners impacts CO and Nox emissions
  - The choice of scrubber impacts wastewater pollution
- The installation can be turned from a low profit high risk option to a high profit option. PPC sells their precipitators on an installed basis. The units are built in modules and assembled and then disassembled in the shop. . Installed costs are typically half that of competitors.

Nederman has total solutions for foundries addressing both worker health and plant air purity along with meeting air emission limits

- **Extraction of fumes at the furnace**
- Melting furnaces generate dangerous fumes. Extraction and filtration is necessary to make the production efficient, to protect workers from hazardous substances and to comply with statutory emission levels. Nederman has close capture hoods for collecting hot fumes from furnaces during charging, melting and pouring.
- **Extraction of dust at moulding lines and sand management**
- wide range of filters, fans and equipment are suitable for everything from single machines to whole processes with multiple extraction points. The company claims to ensure optimum collection of dust with the lowest possible air volume, which is vital for keeping the investment and operation costs to a minimum.
- **Solutions for shot blast machines and casting cleaning**
- Nederman has solutions for extracting and filtering dust from shot blast machines, fettling tables, machining operations and other downstream operations.

## Semiconductor plant buys Duall system combining scrubbers, fans, pumps for critical acidic vapor capture

- In order to comply with Ministry of the Environment emission requirements, Project Engineers at Chartered Silicon Partners, Singapore (CSP) needed gas scrubbers for their FAB-6 expansion. They required six (6) new 40,000 CFM scrubbers with chemical addition and high efficiency mist eliminators to treat acidic process exhaust. CSP also required that each scrubber be supplied with an energy efficient exhaust fan. After thorough analysis of equipment features and benefits, CSP selected Duall model F105 scrubbers complete with redundant recycle pumps and Duall NH fans. All equipment was constructed of UV-PP to provide maximum corrosion resistance and weather protection for outdoor installations subjected to Singapore's intense sunlight and tropical climate. Duall engineers designed the NH fans with airfoil impellers in order to provide mechanical efficiencies in excess of 85%.



# Marsulex will furnish SO<sub>2</sub> removal system for a fee based on tons of SO<sub>2</sub> captured

- In the Ammonia Sulfate (AS) process, the absorption of SO<sub>2</sub> is accomplished with either anhydrous or aqueous ammonia and converts the captured SO<sub>2</sub> into a high value crop fertilizer.
- Marsulex can generate enough revenue from fertilizer sales to offer a build , own, operate approach .
- Mitsubishi and Air Products and Chemicals teamed up to offer a BOO to capture SO<sub>2</sub> using limestone slurry at the Baily station in Indiana. The project was quite successful and has operated for many ears

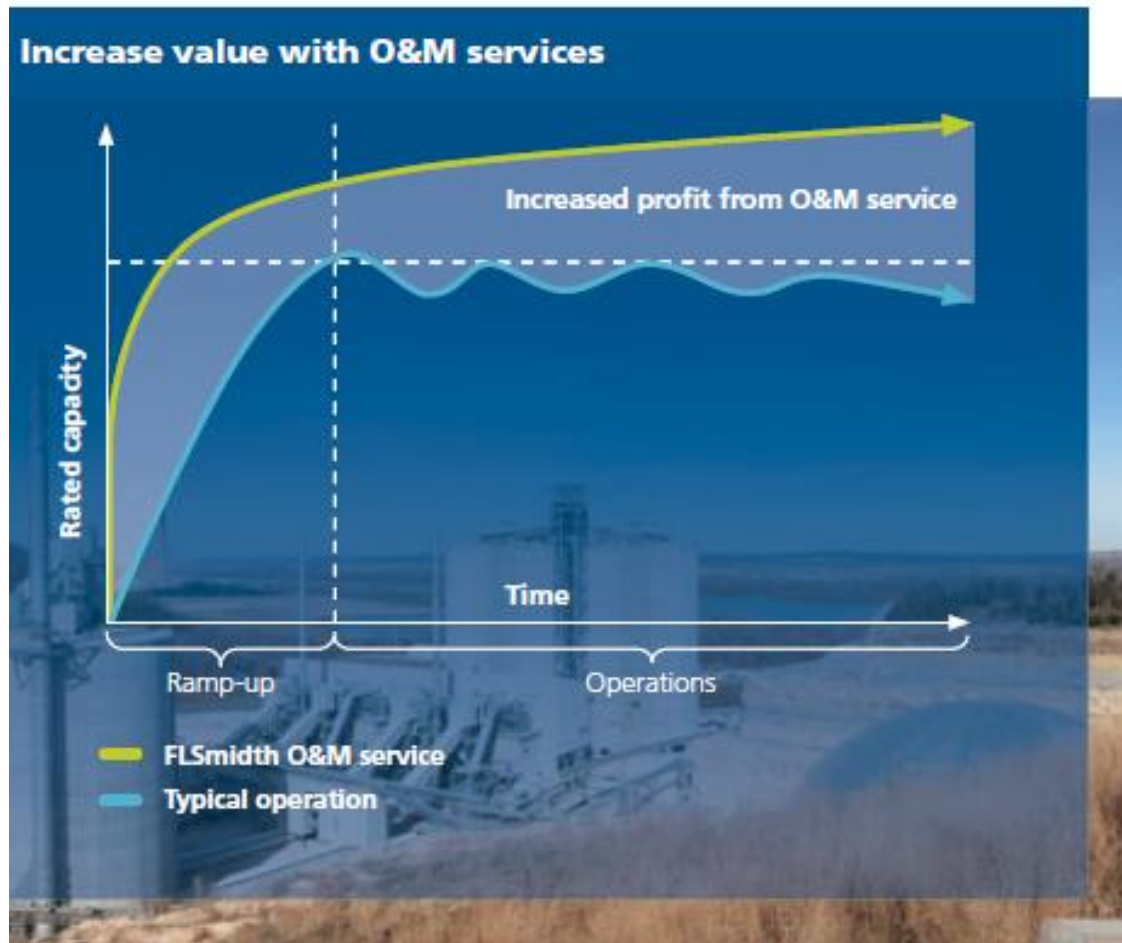
# Total Solutions - Operation

- Process advice: Megtec, advises the chemical company on whether to destruct or capture solvents based on the current price of the solvent. This is an example of the process advice that can be supplied
- Operational tuning: Remote monitoring can allow CECO to advise on reagent adjustments to the scrubber to trigger the order for bags for the collector (each bag can be monitored with an online broken bag detector)
- Fine tuning ventilation systems is a continuing need. The quality of the in plant air affects health and is a high priority for many plants
- Advice on upcoming regulations (safety, pollution control) can allow operators to start planning the needed actions. This also leads to sole sourcing the solution. Flex-Kleen example where the size of the existing collector was doubled has been provided.
- CEMS monitoring. The results are generated continuously and provide a basis for CECO to advise its clients relative to needed changes
- A high profit but possibly high risk area would be to guarantee or share in recovery of precious metals, catalyst, etc. This is a big opportunity in refining. The experts to help CECO do this is already known to Jeff Lang

# FL Smidth division of responsibilities with owner

An example of the division of responsibility	FLSmidth	Owner
Raw materials		✓
Operations (incl. responsibility for production output)	✓	
Plant maintenance	✓	
Technical management	✓	
Employees (recruitment, payroll and management)	✓	
Training and development of local staff	✓	
Office, warehouse and canteen facilities		✓
Office equipment (incl. computer hardware and software)	✓	
Office furniture	✓	
Personnel safety equipment	✓	
Consumables & operational spare parts (on-going consumption)	✓	
Utilities (power, fuel and water)		✓
Security (guards, equipment, fencing, etc.)		✓
Plant, property, liability and equipment insurance		✓
First-aid equipment		✓

# Total Solutions approach can increase plant production and profits



# Total solutions - Maintenance

- There is a big potential to generate profits in the after market - much bigger than the typical service contract and the replacement of hardware
- With the many millions of bags in service the market to replace them is substantial. It is being served by specialized bag companies. However, if the supplier offers lump sum yearly contracts and monitoring operations to extend bag life, the bag revenue can be substantial and the profit high
- The CEMS system requires quarterly audits. GE purchased a stack testing company based on the realization that this was an ongoing revenue producer for every gas turbine installation. A system supplier who sub contracts or owns testing and CEMS companies can insure compliance on a continuing basis.

# B&W inventory management

Inventory management programs are claimed to reduce the overall cost and lead time of obtaining parts and components while maintaining and improving plant equipment reliability and availability. These programs streamline replacement parts purchasing and inventory functions – saving time, money and equipment downtime.

- **Assured Stock Program:**® B&W manufactures parts and components based on yforecasted needs and supports emergency or unplanned repair requirements.
  - The program is adaptable, easily implemented and can incorporate additional B&W services such as component rebuilds, upgrades and scrap purchase of wear parts.
- **ENVantage<sup>SM</sup> Program:** ENVantage Program is a full-service, integrated maintenance and optimization solution designed to improve the reliability and efficiency of utility and industrial air quality control systems.
  - The program includes inventory management and onsite field services for wet and dry flue gas desulfurization systems, wet and dry electrostatic precipitators, fabric filters, SCRs, Multiclone<sup>®</sup> dust collectors and Turbulaire<sup>™</sup> scrubbers, and can be customized

## Benefits

- Reduced on-site inventories and associated carrying costs
- Reduced lead times and paperwork
- Reduced risk of obsolete inventory
- Improved asset management
- Improved planning of stock levels to optimize service
- Guaranteed shipments for emergencies within hours of notification, without priority charges
- Operations and maintenance planning support
- On-site field specialist support

# Durr

portfolio of services includes: .

- modernization
- expert programming
- tele-diagnosis
- seminars and training sessions at Dürr

# Flex-kleen dust collector upgrades

- Flex-Kleen® will inspect existing the shell, hopper and dust handling equipment to assure they're in good repair and recommend replacement of components if necessary.
- Flexkleen will provide a detailed plan and project schedule that will insure completion of the installation with an absolute minimum of down time.
- Flexkleen will remove the existing internal components and install new Flex-Kleen® core-frames, manifolds headers and bag suspension hardware. It can also modify the top, by installing a walk-in clean air plenum, or lift-up doors. The Flex-Kleen® core, with more cloth area will, increase collection efficiency.
- The customer retains the hoppers, steel shell, duct-work, and all discharge mechanisms.
- Flexkleen will engineer the hook-up to the plant compressed air supply necessary to run the Flex-Kleen® pulse jet system. Flex-Kleen® will supply engineering and materials, plus erection supervision, if desired.



# Process optimization

- B&W MEGTEC's experience in air handling, drying, heating, cooling, process and combustion control can help to improve the operating efficiency of a facility and maximize the performance of equipment.
- B&W MEGTEC can help improve operating efficiencies by analyzing current process energy usage and offer solutions to reduce energy consumption.
- Through this process, B&W MEGTEC can:
  - Maintain the equipment to manufacturers specifications
  - Understand the process and obtain baseline energy usage
  - Review the process to reduce airflow and temperature
  - Improve process interface dampers & controls to reduce system demand
  - Investigate energy funding programs and project ROI
  - Investigate system retrofits, controls upgrades, more efficient heat exchangers, new ceramic medias, replace obsolete components
  - Consider secondary heat recovery
  - Investigate potential replacement with new energy efficient system

# Repair parts-Scrubber

description	source	changing method of purchase
Scrubber nozzles	Nozzle supplier	Offer service and replacement contract and purchase and re-sell nozzles as part of contract
Scrubber packing	Packing supplier	Offer service and replacement contract and purchase and re-sell packing as part of contract
Scrubber valves and pumps	Valve and pump Suppliers and others	Offer service and replacement contract and use proprietary products where practical but develop good OEM relationships and partnerships
Scrubber fan parts	Fan supplier	Work up close partnership with one or two fan suppliers and obtain low prices and include as part of service contract

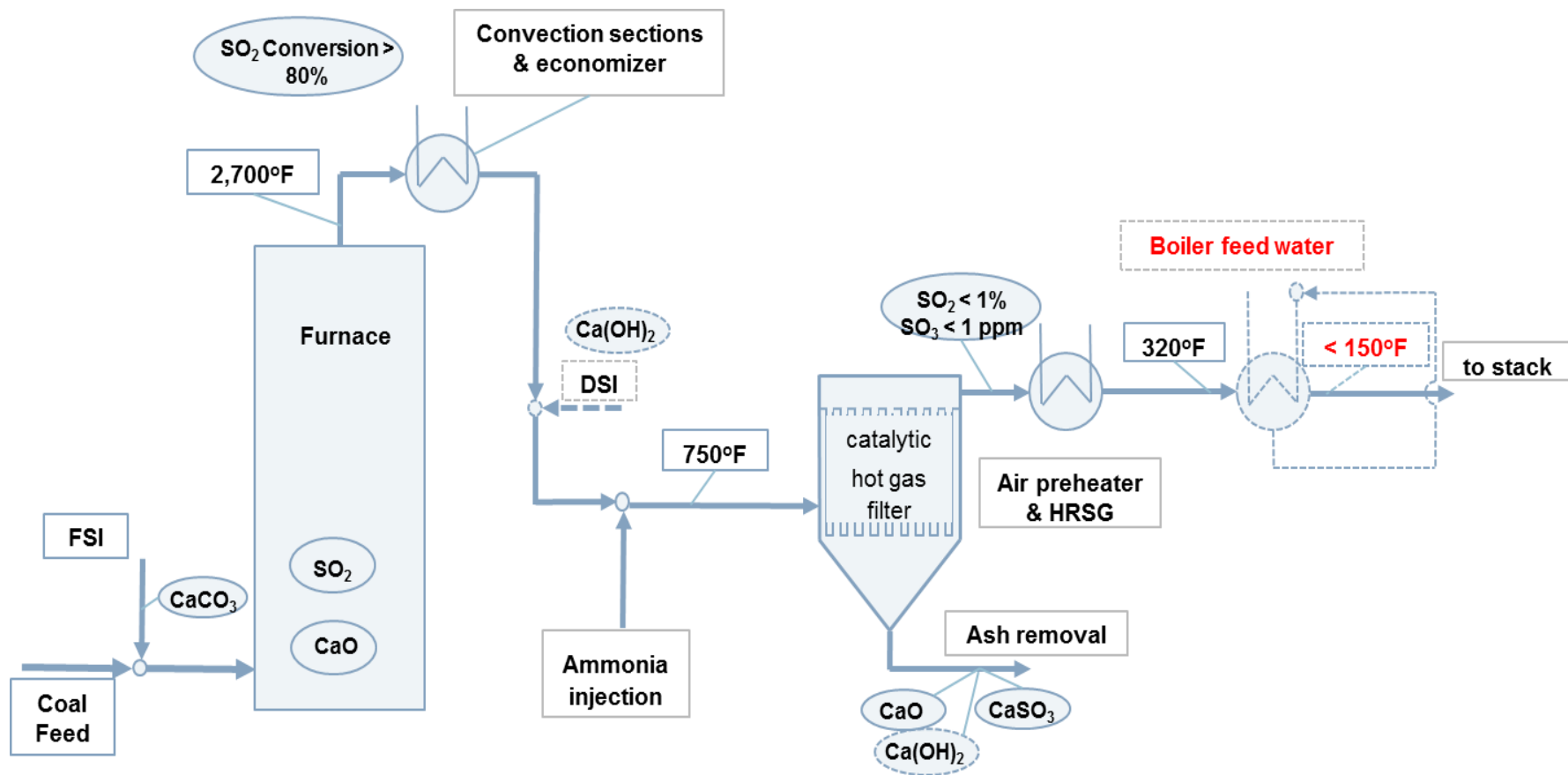
# Repair Parts –Scrubber -2

component	sources	Changing the method of purchase
instrumentation	Varied sources	Monitoring scrubber pressure drop, water flows, slurry concentration and gas emissions involves many different vendors. Lots of time is saved by the purchaser if CECO coordinates it all
Scrubber wastewater treatment	CECO /others	Replacement filter media, belts, agitator parts, motors etc can be part of the contract
Reagents and reagent supply system	Reagent supplier such as Nalco	Why let Nalco turn around and buy basic chemicals and package them as tailored reagents for scrubbers. CECO can buy from the basic chemicals companies such as Kemira and supply the reagents and treatment. Reagents can generate more revenue than the original scrubber purchase over the lifetime of the system

# Services in APC

- Inspection\*
- Installation
- Troubleshooting
- Repair and replacement
- Rebuilds
- Fan balancing
- Equipment relocation
- Performance improvement
- Catalyst replacement
- Engineering studies

## CONDENSING BOILER OPERATION

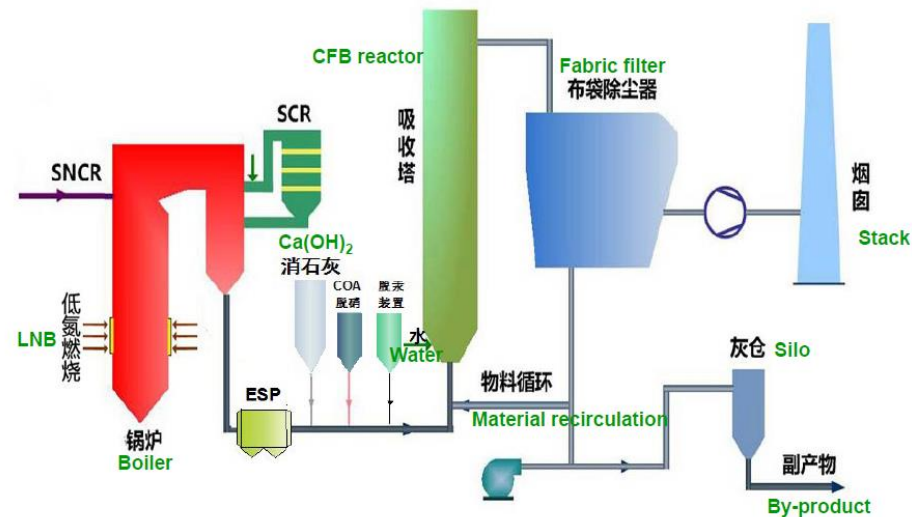


# Longking combines dry scrubber, scr, and DSI with brick making for multi-pollutant solution .



## How to meet the 50/35/5+5/3 requirements?

Dry process : SCR/SNCR + Advanced CFB-FGD + COA



Complex system designs can include unique alternatives such as splitting particulate collection into two devices.

