ITW

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ANNOUNCING THE REVOLUTION

ITW Online Cleaning

will REVOLUTIONIZE TURNAROUND OPERATIONS

and OPERATIONAL EXCELLENCE

by optimizing: PRODUCTIVITY, OPERABILITY, SAFETY HEALTH AND ENVIRONMENT, RELIABILITY, PRODUCT QUALITY, ENERGY EFFICIENCY, CO_2 SO_X NO_X VOC EMISSIONS, MAINTENANCE AND REPAIR, ORGANIZATIONAL REQUIREMENTS.

An entire Unit can be ITW Online Cleaned in as low as 24 hours on an oil-to-oil basis, including all the equipment and not only the relevant one, without the need of opening it.

ITW Online Cleaning a Unit in as low as 24 hours is also a powerful and unique tool to improve Operational Excellence by recovering Unit's performance and by increasing run length.

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ITW ON-LINE CLEANING:
A TOOL FOR IMPROVING OPERATIONAL EXCELLENCE

CASE HISTORY: ON-LINE CLEANING VISBREAKER

ITW On-line Cleaning has been performed during a scheduled decoking of the furnaces, after 1 year operation of a VBU.
Cleaning of the exchangers was originally not scheduled, as the Unit may by-pass the critical preheat exchangers and mechanically clean them during the run.
The Refinery is located in EU.
ITW was ready to start-up the on-line cleaning after 4 days of the written order (which has been issued after only 4 working days from the very first ITW Technologies presentation).
Hereinafter is a summary of the achieved results:

- in 36 hours we cleaned 28 bottom exchangers of a 310 T/h Visbreaker Unit
- the bottom of the Main Fractionator was clean (normally about 1 meter sludge+coke is found)
- the bottom packing of the Main Fractionator was clean
- furnace decoking time has been reduced by about 15%
- the Unit started up 12 hours before the scheduled time, with all the preheat, packing and lines clean (which cleaning was not scheduled)

Visual inspection of the most severe bottom exchanger has been performed in order to validate the result.
The rest of the bottom/preheat train has not been opened.
After such positive application, the Production Mgr. agreed on having a proposal for a regular application of ITW Technology in order to improve Operational Excellence.
ITW Technology is a very powerful tool to improve Operational Excellence, rather than an alternative to mechanical cleaning.
The economics of such an application may give the Refinery a revenue of more than 30 times the one of a simply cleaning.

Monitoring of the Unit for 3 months after ITW On-Line Cleaning further confirmed improved Unit operations.

Bottom bundle as extracted for visual inspection

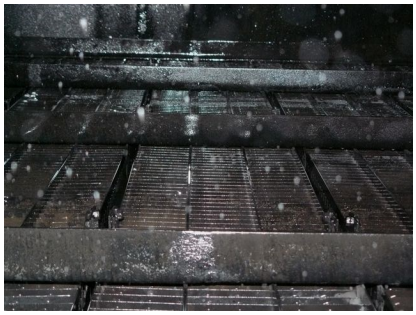
HIGHLIGHTS

ITW technology will optimize:

- PRODUCTIVITY
- OPERABILITY
- Safety Health and Environment
- RELIABILITY
- PRODUCT QUALITY
- ENERGY EFFICIENCY
- CO_2 , SO_X , NO_X , VOC EMISSIONS
- MAINTENANCE AND REPAIR
- ORGANIZATION

Bottom bundle as extracted for visual inspection

Main Fractionator bottom



Bottom packing

Column trays

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CASE HISTORY: ON-LINE CLEANING VISBREAKER VACUUM SECTION BOTTOM TRAIN

ITW Technology has been applied on the Vacuum Section of a Visbreaker Unit. The layout of the Refinery is reported in Figure 2.

The Refinery's problem was related to the increase in Vacuum Section bottom train outlet temperature (reading TI1826).
The Refinery's procedure was to clean the exchangers when the outlet temperature was going to approach 280°C.

During the run, the refinery normally used to mechanically clean 2 exchangers in order to reach the targeted run length.

Before the application of ITW Technology, mechanical cleaning did not help in recovering temperature, so there was a steady increase of reading TI1826.

The Visbreaker Unit was facing therefore an unscheduled shutdown for mechanically cleaning all the Vacuum Section bottom.

To solve the problem, ITW on-line cleaned the Vacuum Section bottom in 48 hours , then VBU started-up immediately.

ITW temperature recovery on TI1826 was on average 45°C, which was stable during the time. (See Figure 1).

The Unit could easily reach scheduled turnaround and run 5 more months.

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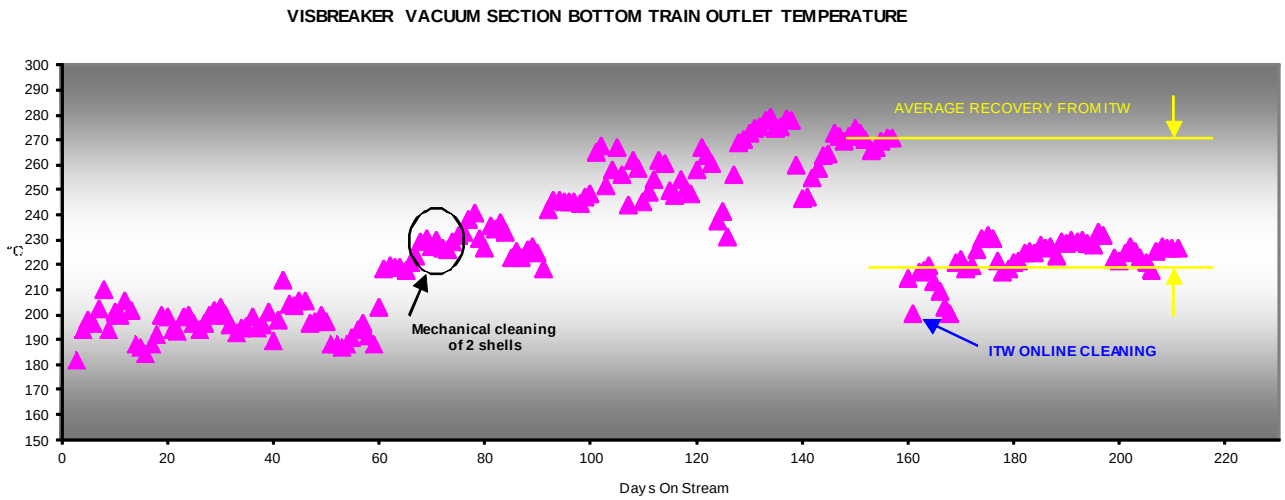

Figure 1. Result of ITW Technology application on VBU Vacuum Section Bottom Train

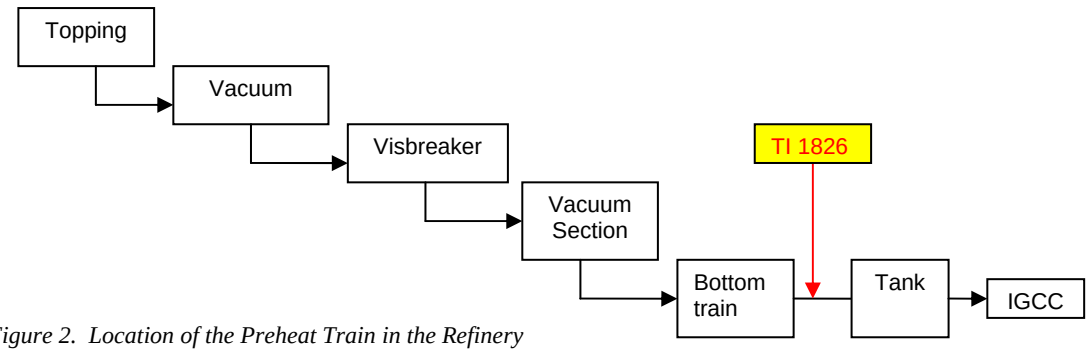

Figure 2. Location of the Preheat Train in the Refinery

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ITW ON-LINE CLEANING: A TOOL FOR IMPROVING OPERATIONAL EXCELLENCE

ECONOMICAL BENEFITS OF ITW TECHNOLOGY

ITW has developed and patented a technology for on-line cleaning equipment on a closed loop basis.

An entire Refinery Unit can be cleaned in as low as 24 hours, including all the equipment and not only the relevant one.

Using ITW Technology and applying it during production to increase run lengths, optimize operations, recover efficiency and obtain energy savings, requires a mind shift from the generally applied methodologies and practices, as current thinking is to clean a Unit only when one has to, that is when yield losses and operating issues have reached a critical level.

We have prepared a Case Study, which can be easily tailored to your case, to exploit the benefits of such an application.

It is however almost impossible to prepare a base case which may be valid for any single Refinery.
The Case Study does not claim to give you absolute figures, but simply order of magnitude ones, which can make you better consider your achievable improved revenues.

We have considered a 100,000 bpd Unit, which is shutdown for cleaning when required.
Achievable revenues are summarized in Table 1.
Working assumptions are reported in Table 2.

We have assumed unitary costs to enable you to evaluate your own costs.
We have then summarized the benefits, in terms of tangible revenues only.

Although the absolute values may differ, as a rule of thumb evaluation, the above can be applied to any production Unit.

Table 1. *Benefits of ITW Technology for a 100,000 bpd Unit*

ITW TECHNOLOGY	UNITS (see details)	REFINERY UNIT NET GAIN
Production loss reduction	23.5 days	11,750,000 USD
Energy efficiency improvement	10°C	809,000 USD
Maintenance and repair costs elimination	Cleaning+parts	930,000 USD
Yields improvement	1% (over 30%)	5,000,000 USD
Reliability improvement	2 days	1,000,000 USD
Safety improvement	1 day	500,000 USD
Waste disposal costs elimination	90 T+4000 m^3	118,000 USD
Organizational costs reduction	1,290 h	83,850 USD
Emission taxes reduction	9,400 T	292,260 USD
CUMULATIVE SAVINGS		20,483,110 USD

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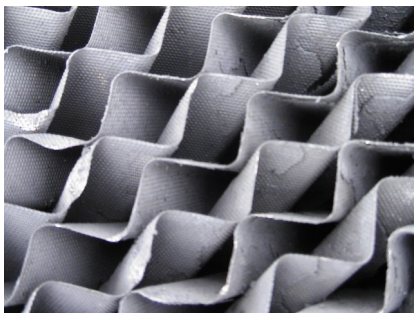
Example of ITW On-Line Cleaning application under End Of the Run conditions: Vacuum Unit (downstream a Visbreaker Unit)

Bottom exchanger extraction



Bottom packing as extracted

Vacuum Tower bottom

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ECONOMICAL BENEFITS OF ITW TECHNOLOGY

In all the calculations we have deliberately fully underevaluated HSE/reliability advantages. Considering that:

- no equipment opening is required;
- only about 100 working hours are required for ITW technology (as opposed to about 10,000 for mechanical cleaning);
- no crane is required, nor any bundle extraction/transportation;
- no airborne emissions or spills will occur;

these are all considerable improvements over current practices, which should be taken into account for a correct evaluation of ITW Technology.

It is important to note, there is a ratio of about 1:34 among the problem cost as is felt (a mechanical cost of about 600,000 USD) and the global refinery cost (about 20,500,000 USD).

ITW Technology evaluation on a cost/performance basis and not simply on a cost/cost basis, will open up new fashinating scenarios for Increasing Refinery Revenues and Improving Operational Excellence.

A tailor made operative study can be issued based upon your actual needs (configuration, capacity, etc.).

The full Case Study and an easy-to-use spreadsheet can be sent to you upon request.

Table 2. *Example of Basic Working Assumptions for a 100.000 bpd Unit*

USD exchange rate	USD = € 0,769	EURO = $ 1,30
Refining margin	5 $/bbl	
Crude density	0.84 kg/m^3	
Crude C_p	0.5 kcal/kg ° C	
Refining margin	31.45 $/m^3	24.19 €/ m^3
Design throughput	100,000 bpd	
Hourly refining margin	$ 20,833	€ 16,026
Daily refining margin	$ 500,000	€ 384,618
Average mechanical cleaning cost (for heat exchangers)	$ 30,000	€ 23,000
Waste disposal cost (solids in mechanical cleaning)	$ 1,200/T	€ 923/T
Heat exchanger solid waste generation of mechanical cleaning	3 T per bundle	
Colum and filters solid waste generation of mechanical cleaning	30 T	
Bundles in the Unit	20	
Column cleaning cost	$ 104,000	€ 80,000
Packing replacement cost	$ 130,000	€ 100,000
Furnace Inlet Temperature decrease	10 °C/year	
Diesel selling price	325 USD/T	250 €/T
Average Refinery man-day cost based on 250 working days (Refinery cost)	$ 520	€ 400
Average Hourly manrate (Refinery cost)	$ 65	€ 50