required is structured and well defined AND business partner can provide identity, authorization and reputation for the product/ service/ information transaction AND the terms of the transaction can be defined without ambiguity by the participating parties in the transaction AND the success of the transaction can easily be measured, observed and verified by the involved parties **THEN** the case is relevant for Smart Contract

There are a number of potential uses for Smart Contracts within the process industry sector. These include:

SUPPLY CHAIN: Supply chains encompass the end-to-end flow of information, products and services, and money. The way these components are managed affects an organization's competitive positioning in areas such as product cost, working capital requirements, speed-to- market, and service perception. Organizations are exploring innovative methods to streamline their supply chains to meet evolving consumer demands and optimize efficiencies. Technological advances are collapsing linear supply chains into dynamically connected and always-on digital supply networks (DSN), transforming how businesses exchange and share information and assets. The business leaders are undergoing pressure to innovate and reconfigure their supply networks, maximizing value and efficiencies while reducing costs in an increasingly competitive world. Despite DSN enhancements, paper- based processes are still common, resulting in reduced transparence and collaboration across networks. Decision making amongst supply chain actors is further complicated by disparate systems which provide limited visibility of other functions. Organizations have been exploring ways to enhance transparency and data sharing across their networks. These initiatives have focused mainly on intra organizational collaboration to gain higher efficiency.

Blockchain powered Smart Contract could be the enabler to allow organizations to more effectively tackle these issues of traceability, compliance and flexibility. Blockchain provides a full audit trail of data, creating an everlasting means of record keeping along a supply chain. All Blockchain transactions are timestamped and tamper-proof, providing a single source of data integrity, thus immutable. Continuous real-time tracking of data is facilitated through the use of Smart Contracts across the supply chain. Blockchain enables peer-to-peer interactions which can be trusted based on the digital signatures.

Blockchain, Smart Contracts and IoT can bridge many gaps in the supply chain ecosystem. The end-to-end visibility and real-time transmission of relevant information about the whereabouts of the goods and consummation of inventory is feasible through Smart Contract. This would assist manufacturers, suppliers etc. in accurately forecasting future inventory requirements, among other Things. The automatic settlement of inventory payments and calculation of volume and quantity discounts without any errors or glitches or the added costs of auditing massive

amounts of data is normal for a Smart Contract.

In a recent pilot, Hyperledger applied the Hyperledger Sawtooth (its distributed ledger technology and Smart Contract engine) to trace the produce (e.g. seafood). While IoT ensures the information is transmitted in real-time, the Blockchain ensures that the data uploaded to the Blockchain is immutable, irrevocable, tamper-proof, and available for all to view. The technology also tracks and records the distribution of the produce through the chain. Hyperledger believes that a Blockchain-operated supply chain has many advantages; it results in transparency between vendor and suppliers, a level playing field for all suppliers, an incentive to adopt good practices, and reduction in operation costs and time.

IoT: Currently, the implementation of IoT and Blockchain is on the agenda in industry and there are already promising solutions and initiatives in several areas. As Blockchains and crypto currency systemsproliferate, there are several crucial implications for IoT and the creation of smart systems. For one, the Blockchain technology could provide a mechanism for tracking unique history of the IoT individual devices recording them on the Blockchain and monitoring the exchanges between them and other devices. Easily tracked and authenticated Blockchain data from IoT gives manufacturers more and better data about how their products perform over time, enabling them to improve quality. This also helps moving beyond production to proactive replacement of failing parts. Besides, Blockchain is also available in the other IoT applications, such as remote software updates. Particularly, Blockchain plays an important role in energy trading for IoT applications in energy Internet. Smart Contracts could also allow smart devices to become self governing agents. **Such Agents could autonomously conduct a variety of transactions in the Smart Contract ecosystem**. The inclusion of data science capabilities to Smart Contracts may promote self-enforcing financial contracts that execute without third party. There is emergingBlockchain technologies which have investigated how to promote energy sharing among IoT devices to increase efficiency of energy utilization.

He is especially excited about the emergence of pre-programmed “smart contracts” that can trigger transactions automatically.

Energy grid: The smart contracts, can be set to allow individual solar energy producer (prosumers) to feed surplus energy into the grid through a blockchain-enabled meter. The flow of electricity is automatically coded into the blockchain, and algorithms match buyers and sellers in real time based on preferences. Smart contracts then execute when electricity is delivered, triggering payment from buyer to seller. Removing financial transactions and the execution of contractual commitments from central control brings a whole new level of decentralization and transparency that the industry which has never had before.

OBSTACLES

As with any new technology, the adoption of Blockchain Smart Contract into modern supply chains will not be without impediment. The instant provision of trust among trading partners, and the ability of Smart Contracts to negotiate and finalize transactions, may require major changes in workflows and business processes. Current infrastructure will have to be upgraded significantly. The small number of intermediaries that will continue be essential on Blockchain-based supply chains will have to come onboard with the new technology. Governments will have to co-operate at various nodes on the supply chain so that the system works seamlessly. Legislators and courts will have to open up to the idea of Smart Contracts between vendors.Similarly IoT smart contracts have one central challenge with the underlying blockchain technology which is limited throughput viz-scaling up from the current maximum limit of 7 transactions per second. Some other issues include increasing the block size, addressing blockchain bloat, countering vulnerability to 51 percent mining attack. Issues like Latency-slow transaction confirmation, Government Regulation, Privacy challenges, wasted resources for mining are surely the bottleneck presently being encountered.

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BIOGRAPHIES

Sh.Arupjyoti Saikiais serving as an Assistant GeneralManager (Instrumentation) in Engineers India Limited-New Delhi. He has over 19 years experience which includes R&D, Maintenance and Engineering.As an Instrumentation &Control Professional he has extensive experience in execution of various Oil & Gas industry projects such as MRPL phase III PFCCU, GAIL Pata GCU-II, IOCL BS-VI, and overseas assignment. He has published two papers in international Journals, two papers in Petrotech-2006, 2019, one in ISA Delhi-2015 and one in FCRI Palakkad "Flowtek-G" Global Conference - 2017. He holds B.E degree in Instrumentation & Control form Gujarat University and MBA from IMT-CDL Ghaziabad.

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Sh. Rajiv Gupta is working with EIL for the past 34 years. An Engineering Graduate in Instrumentation Technology from MACT (Bhopal). He joined EIL in 1984 as Management Trainee. He is currently CGM-HOD of Instrumentation Department.

As an Instrumentation & Automation Professional he has extensive experience in execution of various assignments covering wide spectrum of industry ranging from Offshore, Pipeline, Gas Processing, Mega Refineries such as GGSRL, BORL etc, Petrochemical complex like MGCC.

He has been involved in conceptualization and execution of Control and Safety Systems for major grass root refineries, petrochemical plants in India. He is a certified TUV Engineer. He also played a key role in bringing in state of art technology in Instrumentation and Automation in Process Industry such as HART, FF, and Wireless.

As EIL nominee he is currently the member of OISD and his valuable inputs are a part of OISD Standards followed by Oil and gas industry.

EMERSON

Bridge HSE gaps with wireless toxic gas monitoring

Hydrogen sulfide gas or H2S is one of the most common hazards in the process industries. H2S is colorless, flammable, and extremely toxic. The gas can accumulate in any area where oil or natural gas is processed, stored, or transported, as well as in other applications such as sewage and wastewater treatment facilities.

Leveraging the benefits of the latest digital technologies, wireless toxic gas monitors allow users to extend the protection of toxic gas monitoring to their most challenging applications. Today, many end users are forced to rely solely on personal or portable toxic gas monitoring solutions. These devices are not intended to provide continuous coverage of a facility's assets and they force plants to send personnel toward a potential hazard without knowledge about the concentration of toxic gas in the area.

A Wireless gas monitor can be used for general guidance by sending updates on gas concentration once every hour with the LCD screen disabled to extend power module life. Alternatively, a manager may choose to use the device as a safety monitor – providing updates to the host system every two seconds, keeping the LCD display on constantly, and utilizing a discrete output option to trigger local alarms to protect workers.

The lesser time users need to spend interacting with field devices, the better. Minimizing interaction time not only decreases costs for users, but it also improves safety since fewer personnel-hours need to be spent in hazardous areas. Ease of maintenance and stocking concerns should be considered when selecting a gas monitor.

Wireless gas monitors should meet the performance requirements that characterize the top quality wired toxic gas detectors. Gas detectors are compared with one another based on their abilities to accurately and quickly detect the presence of gas. Users should select a gas monitor that uses industry-standard sensing technology and makes no sacrifices in terms of accuracy or speed of response. Electrochemical sensors have a finite service life. This life is dependent on ambient conditions, but it typically will last from one-and-a-half to two years in service. It's best for managers to select a sensor that is contained within a replaceable, intrinsically safe module that can be removed and installed without tools, so there is no need to remove the device from the hazardous area. Some Wireless gas monitors also have diagnostic capability that can communicate that the sensor is nearing the end of its useful life, helping users plan replacement operations efficiently.

Monitoring H2S at challenging locations using a Wireless toxic gas monitoring system provides users with the fundamental advantages of Wireless technology – and a great deal more. Users can now leverage on these advantages to adapt to HAZOP changes by implementing wireless gas monitoring into their digital transformation and safety plans.

SHING YENN TAN
Product Manager – Rosemount Flame & Gas Detection
Asia Pacific

SITUATIONAL KNOWLEDGE BRIEF **COAL PLANT CYCLING**

Fossil Plant Cycling

Renewable generation is altering the landscape for power producers. Wind and solar assets are typically placed into the power grid whenever they are available, but since they are intermittent, formerly base loaded power plants are cycled to ensure a constant grid supply (grid supply must always equal grid demand).

Unfortunately, many plants were not designed to operate like this and the increased amount of thermal cycling can lead to premature equipment failures.

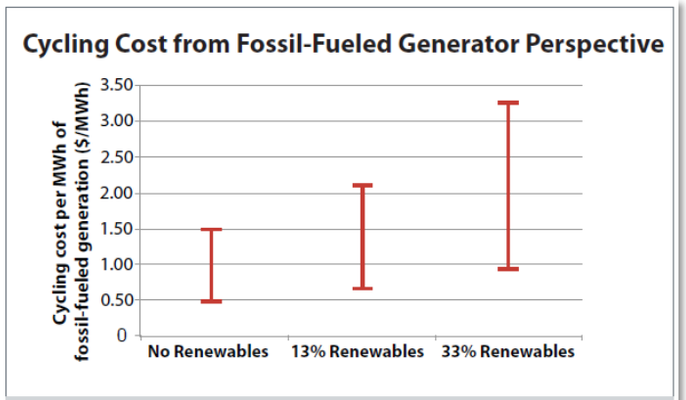
Another side effect of cycling is that, over time, the unit heat rate goes up from wear on heat exchangers, valves, and other automation equipment. There are multiple approaches companies must make to address cycling including: improving reliability, making operational changes, and addressing heat rate.

Reliability is a Strategy

A quick terminology review: Availability describes the reliability of power plants on a percentage basis. It refers to the number of hours the turbines are available to produce power divided by the total hours in a year.

Plants look at reliability programs as a means to improving their availability. For most parts of the world, when a plant is contracted to produce power, but is not available, there are financial consequences. Beyond the financial piece, certain countries are running in a constant power deficit and when a generating unit is unavailable, Plant owners are subject to brownouts, rolling blackouts, or full blackouts.

Improving reliability is a top industry concern among utilities and doing so can have a significant impact on profitability. A company wants to ensure that it spends enough, but not too much to achieve a percent availability enables them to avoid spending on being “unavailable”.



From a fossil-fueled generator perspective, cycling costs increase with increased wind and solar penetration.

Operational Flexibility

In countries where there is a power surplus due to increased renewables, many coal plants are now required to idle at minimum load at night, rapidly swing and follow loads during the day, and then quickly return to idle at night. Sometimes they are even shutdown and need to start up quickly when required. Depending on a country’s power grid requirements, coal plants are also called upon to provide primary frequency support on the grid which requires quick load changes or load maneuverability. Regardless, these operating profiles pose three fundamental problems:

1) These units were not designed to regularly idle at minimum loads
2) Baseload plants were not designed to ramp quickly
3) Coal plants are not meant to be shut down and started up regularly

The good news is that these plants are capable of operating this way with some changes. Some utilities will choose to undergo complete boiler and turbine retrofits to make a unit more suitable for cycling, but in most cases, changes to control strategies combined with some targeted equipment modifications can improve plants greatly.

To improve operational flexibility, there are essentially three things that can be addressed: starting a plant faster, ramping to load faster, and being able to run in standby at lower minimum loads (also called plant turndown).

Identifying Pain Area – Improve Flexibility & Availability

Whether or not availability is important to the Power Plant user or whether is it subject to cycling (hot starts, warm starts, cold starts, load following). If the plant's grid has renewable power, chances are his coal plant is subject to some cycling. The following is designed to help you drill down to potential solutions we can provide to improve the coal plant operations.

Operational Flexibility & Availability Improvements
Potential Opportunities to improve performance in a cycling environment

Desired Operation	Plant Challenge	Potential Cause	Solutions	
Boiler	Tube, reheat section, waterwall leaks	Thermal cycling	Soot blowing optimizer	
			Model-based Steam Temperature Control Optimizer	
Fast Startup	Inability to startup quickly to meet load demand	Older controls without automated startup procedures	Load demand control Optimizer	
Improved Ramping or Load Maneuverability	Unstable or slow ramp rate on load changes	Uncoordinated boiler controls	Model-based Steam Temperature Control Optimizer	
Lower Turndown	Low load instability	Combustion instability at lowest loads	Load demand control optimizer	

SITUATIONAL KNOWLEDGE BRIEF **COAL PLANT CYCLING**

Model-based Steam Temperature Control

Conventional PID-based steam temperature control provides a linear response to setpoints and reacts only when an error has occurred. This approach causes excessive spray valve movement, adds stress to boiler parts because of overshoot, and lowers a plant's ability to ramp quickly.

Emerson's model-based control enables better temperature regulation through the development of steam temperature process models. It is based on iterative, finite-horizon optimization of a plant model.

Convection, radiation energy, and sootblowing effects can be used as model inputs. The overall goal is to provide precise optimal control of the boiler temperature by providing predictive control of changes in the heat release due to load, fuel BTU quality, radiant energy absorption, pass dampers, burner tilt, and spray valve performance. This model-based solution permits faster ramp rates, improved turbine life, and reduced stress on boiler pressure parts.

Sootblower Optimization

In large utility boiler operations, effective removal of fireside soot deposit has long been a challenging task. Frequent operation of sootblowers wastes steam, increases blower maintenance cost, and can aggravate tube erosion. Conversely, infrequent blowing allows too much soot accumulation and decreases heat transfer efficiency. It may also cause high stack opacity when a fouling area is being blown.

Emerson's sootblower optimization solution develops boiler section heat absorption models that accurately reflect the performance of your heat transfer sections. It has the ability to dynamically calculate the cleanliness factors of the process at all times, even while the plant is moving through load ranges. Once modeled, the optimization controller delivers sequenced sootblowing control that efficiently manages steam and energy while avoiding opacity spikes. This optimization develops strategic sootblowing sequences, ensuring that a plant only blows soot when needed and only in necessary locations.

ADVANCE BLENDING SOLUTIONS – TOWARDS BETTER REFINERY MARGINS

Ajay Patil
ABB India Limited-Bangalore

ABSTRACT

This paper helps how to optimize and enhance theReturnOn investment by addressing specific challenges and concerns associated with refinery blending. More importantly, it can positively influence profitability and productivity. While several solutions and techniques address the growing concerns of refiners, ABB has developed a more cost-effective, flexible and modular solution, enabling enhancement in refinery margins.

KEYWORDS

Advanced blending control, optimizer, analyzers, inventory control, re-blending, regulatory blend control, over-correction, modelling, FTNIR, shelter, optimization, feasibility, blend laws,

INTRODUCTION

Fuel Product blending is an important and final step that determines the right product quality - meeting Government regulations, international or industry specifications, matching the recipe defined amongst many others.

Product blending is an important and final step that determines the right product quality - meeting Government regulations, international as well as industry specifications, matching the specified recipe defined amongst many others.

Fuel product blending is a tool to see that whatever the advance process control measures have been taken up in upstream process units to get the desired quality are shaped well to earn back the revenue through the final product blending. In other words it is the last remedy to correct the specification to avoid / minimize give away in tight constrains.

Over-correction: The major factor that truly affects profitability and cancels out benefits gained in upstream unit process areas. Setting up more tight control ranges can result into this. Eventually with corrections happening in a blend will also be taking away costliest component which are available for premium grade product blending.

Inaccurate flow measurement: This results in erroneous readings and ultimately, products that don't meet specifications, having a negative impact on production cost and overall profitability. A complete blend mass balance will not be available.

Analyzer performance and repeatability: Minimizing the difference between a measured physical property and a critical specification on a tactical level can have a significant impact on refinery profitability. Analysers with good repeatability provides tactical input to the closed feedback loop optimization, if this is missing then purpose of refinery blending will be difficult to achieve.

Absence of / non-working analyser will transfer the sample checking to laboratory which will take at-least 8 hours to get the main properties.

Blend flexibility: Not being able to make smaller blends does not permit accurate blending control/systems that restrict more accurate specification.

Inventory control: Inaccurate blending may often result in holding number of product tanks and stock that increases delivery cost.

Re-blending: This is the single most factor affecting pulling out the profits for refineries. Also poor or inaccurate blending increases operational cost and lowers productivity.

Complex blending operation: The biggest deterrent to accurate blending is having multiple constrains and associated controls and systems that are difficult to use.

Real-time planning and optimizing: Inability to plan, schedule and optimize the operation based on real time information results in off specification.

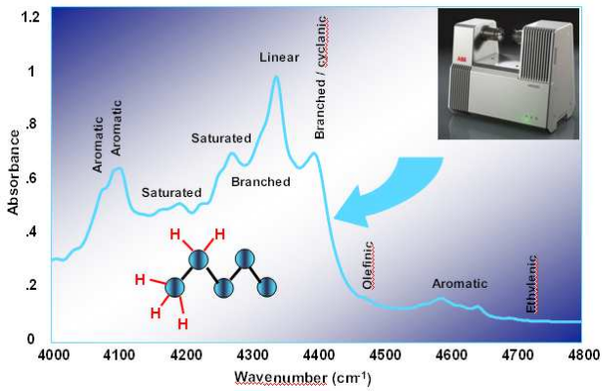
MAJOR ISSUES

Many of the above enlisted issues are well handled by looking into each of the below aspects

1) ANALYSER SELECTION & MODEL

The success of any blending project is largely dependent on three elements:

1. Quality of both spectrometer & reference
2. Chemo metric models data generation
3. Model updating with change in streams



Analyzer modelling is the heart of the blending system and instrumental in the success of any blending project. Laboratory results include the site precision of your Refinery Laboratory and FTNIR models will not have any better precision than the refinery laboratory.

Another careful consideration to be given for analyzers having Opto-mechanical weakness resulting in analyzer drift, since it will make more difficult to achieve the long term stability / wavelength.

So, don't let your CAPEX (Capital Expenditure) savings on analyzer selection result into an inefficient blending package causing giveaways in final product quality , poor OPEX (operational excellence). You will get what you buy so do a techno-commercial

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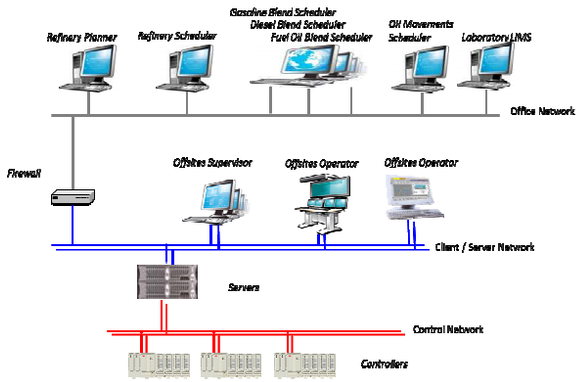
evaluation with ROI for selection ofanalyzers.

2) ORGANIZATION MOTIVE & CULTURE

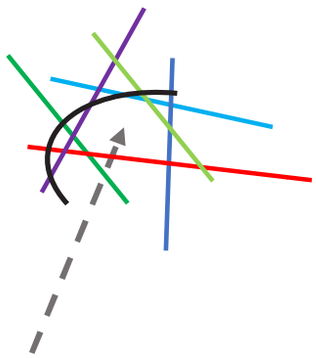
One of the key factor is having a Cross-Functional team which works in Cooperative & collaborative working.



Using the same system and data, all the involved like Planners, Schedulers, blend engineers, analyser technician, instrument engineer, and operatorscan study and close the feedbackfrom the existing blends to improve further upon the refinery upstream unit operations.

3) OPTIMIZATION SOFTWARE

Optimization software is an area where we cannot take much insight. A good optimization engine should have abilities to



Feasible solution space

- Gives an insight to the blend with offline optimization, predicting product quality
- Allows optimization and recipe correction even without analyzers
- Spot and Composite sample handling
- Allows retroactive correction of the blend based on samples and lab result
- Tank quality integration over time TQI
- Data entry can be integrated with LIMS or manual entry in ABC
- Manages rundown piping & heel quality
- Able to handle the infeasibility

4) ANALYSER SHELTER INTEGRATION

Design of a sample handling and sample conditioning requires detailed engineered approach along with experience in integrating all different analyzers. Different analyzers will be in need of different treatment and inlet pressure at the inlet of the analyzer. In such cases, vendors experience matters a lot to qualify for a proper sample conditioning, so that sample cells are protected and analysis is accurate.

Points to consider while selecting analyzer shelter with related sample handling system

1. Easy to maintain for all analyzers installed& replace the parts while in working condition
2. Redundant HVAC system will enhance overall analyzer lifecycle
3. A proper filtration system to avoid any contamination

4. Sample cell temperature to be maintained with heating /cooling system
5. Wake frequency calculation for the probes to be done
6. Field tubing is based on minimum lag
7. A good software for FTNIR controls the referencing, sample handling, validation, data archiving, etc. minimizing manual intervention
8. We can add on multiple streams to one channel by switching the process streams using the DOs available from FTNIR thus multiplying the possibility of streams that can be analyzed using single FTNIR
9. The sample cell should be installed in the temperature-controlled cabinet (approx. 25 deg.C) to have better repeatability and have correlation with the modelling done at Lab analyzer
10. The fast loop is to be designed such as to reduce the lag time and meet the response time required.

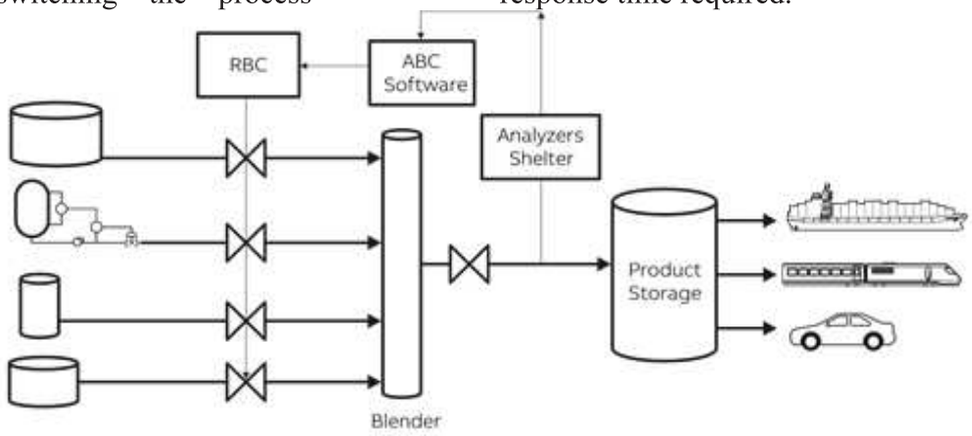


Figure: Advanced blending solution

CONCLUSION

An integrated blending system, single-point design, engineered with minute details taking care of FTNIR analyzer modelling and then subsequent commissioning, including control system saves project and operational costs in long term. High-accuracy FT-NIR spectroscopyensures consistent and reliable measurement without having to re-correct FT-NIR models.

Off-line optimization of blend order with Blending software will be critical for Planner to determine deviation range in the presence of different property constraints and tight blend control targets. This helps reduce multiple iterations all together otherwise required, thereby improving overall productivity.

A simple user-interface with an off-line pre-blend optimization tool allows fine tuning of the blend recipe to minimize deviations from actual blend specification. The giveaway in RON, MON, RVP and other properties are minimal and blends are produced without any property violation.

Finally, a small recipe differences have significant impact on product quality giveaway. Now it is up to the refinery operations to look towards this differenceseither as a profit making opportunity or a loss by eroding out the earlier upstream units saving, resulting in giveaway ….if you are thinking of better refinery margins then you need to act upon then BRIFT “Blend it right, first time

Notes

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