



Billings Refinery

April 22, 2015

Dear Council Member:

Please find attached the minutes from our April 14, 2015 CAC meeting. The next CAC meeting will be on **TUESDAY, MAY 12, 2015** at our usual meeting place – the Phillips 66 Learning Center adjacent to the refinery. Dinner will be from 5:00 to 5:30. The meeting will run from 5:30 to 7:30.

Sincerely,

Ann L. Clancy, Ph.D.
Meeting Facilitator

**Meeting Location:
Phillips 66 Learning Center
415 South 24th Street**

**PHILLIPS 66 BILLINGS REFINERY
CITIZENS ADVISORY COUNCIL
April 14, 2015**

MEETING MINUTES

Present: Council members: Bob Carr, Ralph Hanser, Travis Harris, Bruce MacIntyre, Gregory Neill, Melissa Patton, Katey Plymesser, Jim Ronquillo, Melanie Schwarz, Emily Shaffer, Andrew Sullivan, Michelle Zahn
Phillips 66 management: Colin Franks, Randall Richert, Mark Hilbert
Facilitator: Ann Clancy

Absent: Keith Beartusk, Paul Dextras, Lance Johnson, Shirley McDermott, Eileen Morris, John Pulasky, Ray Rigdon, Mike Yakawich, Stella Ziegler

Guests: CAC Member Guest: David Pals
Phillips 66 Refinery: Carl Perkins, Operations Manager; Steve Kelley, Technical Manager
Christian Home Education Cooperative Chemistry Class: Cheryl Anerson, Teacher; Gayla Kelley, parent; and students Justice Craig, Nadin Lund, Emily Kelley, Lauren Fordham
MSU-B Pre-engineering students: Kenton Beebe, Nickos Vlakos, Chris Wayhr, Jake Linnell, Kyle Alderman
City College Process Plant Technology students: Michael Baker, Jesse Brockschmidt, Cody Dayley, Adam Goodburn, Justin Hengelfelt, Hunter Maddox, Austin Pickering, Victor Pulse, Robert Ross, Cody Shelmerdine, Matt Sterchi, Dayton Willoughby

AGENDA

- Welcome/Introductions
- Refinery & Transportation Updates
- Refinery 101 Presentation
- Refinery Tour
- Next Meeting: May 12, Pipeline Safety Presentation

WELCOME/INTRODUCTIONS

Colin Franks, Refinery HSE Manager, and Carl Perkins, Refinery Operations Manager, welcomed guests and CAC members to the refinery presentation and tour. Carl gave an overview of the core values of Phillips 66 and a brief background on the history of the Billings refinery.

Visitors included David Pals, a guest of Bob Carr, and three groups of students. There were 12 Process Plant Tech Program students in attendance as well as 5 students from the MSU-B Pre-engineering program and 4 high school students from the Christian Home Education Cooperative chemistry class. Accompanying the high school students was teacher Cheryl

Anerson and Steve Kelley, Technical Manager with the refinery. His daughter was a member of the chemistry class and he was accompanied by his wife Gayla.

REFINERY UPDATE

Carl Perkins reported the following:

Operations: The refinery has been running well over the past two months with record production over the last quarter due to some issues with refineries on the west coast which resulted in the Billings refinery being able to supply more diesel and gasoline fuel to that area. In terms of volatility of the global oil market, Carl talked about political activities impacting oil prices such as the embargo on Iran. If it were lifted, the excess oil supply currently stockpiled in Iran would be released and further drop world market prices. Carl also mentioned there are upgrades being made within the refinery gates that will be evident on the refinery tour.

Safety: The refinery has been continuing to invest millions of dollars annually in process safety management (PSM) activities and incorporating OSHA guidelines for PSM projects. Even safety incidents occurring at other refineries are evaluated as a way to pre-investigate and prevent similar occurrences at the Billings refinery.

Environmental: The arsenic treatment plant is now in operation at a cost of some \$27 million to construct. Every year the refinery replaces equipment to reduce emissions. With upgrades and maintenance projects over the past 25 years about half the refinery has been rebuilt including updated electrical and master control systems. Initial funding for the new crude and vacuum improvement project has been released and final approval for the entire project is expected in the fall of this year. The project will bring in about 500 temporary workers who will, in turn, generate a positive economic impact on the community.

People: Union negotiations have finally been settled nationwide. An agreement was struck at the end of March between Shell Oil, the national negotiating partner, and the United Steel Workers (USW). Carl was the lead negotiator for the local refinery-union negotiations which went very well. During the strike period, the USW took out 16 sites nationally – none of them Phillips 66 refineries – a few of which are still not back in operation. There were no strikes in the Billings area.

TRANSPORTATION UPDATE

Mark Hilbert reported the following:

Operations: Transportation is the midstream part of the company which moves products in and out of the refineries by means of pipelines, trucks and railways. Operations are running well with lots of through-put. Some pipelines have been operating at their highest average flow due to the demand on the west coast. About 217 calls from residents and businesses have been made so far this season about the location of pipelines as people need to dig around them. Mark reported three current projects are underway: the conversion of diesel and gasoline products from winter grade to summer grade; upgrades/maintenance of five areas along the Yellowstone Pipeline between Bozeman and Missoula during one 24-hour outage period; and a smart pig project in the Pioneer pipeline to Salt Lake City to identify potential anomalies.

Safety: Safety record has been great with no recordable injuries since 2008.

Environmental: No environmental incidences to report.

REFINERY 101 PRESENTATION & REFINERY TOUR

Andy Holman, Senior Process Engineer gave a Refinery 101 presentation in anticipation of the refinery walking tour. As part of the presentation, he passed around samples of the refining process products and catalysts.

Refinery History and Capacity

The Billings refinery opened in 1949 and has been expanded seven times over the years, which has increased production from 7,500 barrels/day to 60,000 barrels/day.

1949 Start-up	7,500 barrels/day
1956 Expansion	10,200
1963 Expansion	32,000
1967 Expansion	52,500
1992 Coker Project	
1994 FCC Feed Hydrotreater	
2006 Ultra Low Sulfur Diesel	
2009 Low Sulfur Gasoline	
Currently at 60,000 barrels/day	

He described the refinery as an “integrated” business with a value chain that involves crude oil supply and other feedstock, crude oil storage, crude oil pipelines, the refining process, product storage, product terminals and retail stores. He noted that the value chain, from oil well to the gas pump, has to be synchronized well in order to succeed.

He talked about the crude oil pipelines that are necessary to the functioning of the refinery. The two main pipeline systems are the Express and Glacier pipelines which bring crude oil down from Canada. There are also the Rockies product pipelines, which move finished products from the refinery to the markets. These include the Yellowstone and Seminoe pipelines, which are also Phillips 66 assets. About 80% of the products are sent west to Washington. The refinery is heavily dependent on pipelines, which is an advantage as the pipeline systems support the company’s integrated value chain.

Chemistry of Refining

Crude oil is a mixture of hydrocarbons in which hydrogen bonds with carbon in multiple ways to generate different products:

- Smallest (Methane) $C + 2H_2 = CH_4$
- Bigger (Propane) $3C + 4H_2 = C_3H_8$
- Bigger (Gasoline) $8C + 9H_2 = C_8H_{18}$
- Biggest (Asphalt) $\sim 100C + 101H_2 = C_{100}H_{202}$

Each crude oil has a unique “fingerprint” characterized by region, density, sulfur, and acid content. The refining industry is based on: The poorer the crude quality, the more complex the refinery.

What do Refineries Do?

Billings Phillips 66 is a fuels refinery, converting crude oil into a wide array of products:

- Fuel Gas (Consumed)
- LPG (Propane & Butane)
- Gasoline

- Jet Fuel (Kerosene)
- Diesel Fuel
- Coke (Fuel & Specialty)

The Refiner's Challenge

Less than a third of each crude oil barrel is directly useable as a motor fuel but 94% of crude overall is transformed into valuable fuels.

Gasoline	10%
Jet fuel	5%
<u>Diesel</u>	<u>15%</u>
Total light oils	30%

As a result, the challenge of the refinery is to use chemistry in a variety of different refining processes so that the refinery can make the most of the refining process by transforming 94% of each barrel of crude into more valuable fuels, such as gasoline (55%), jet fuel (7%) and diesel (32%). There are six different processes using a complex mixture of hydrocarbon molecules:

Refinery Block Flow

The job of the refinery is to turn crude to product. Out of the 30+ units in the refinery, there are 10 major ones critical to refining: large crude unit, small crude unit, vacuum unit, coker unit, catalytic reformer, HF alkylation unit, fluidized catalytic cracking (FCC) unit, and three hydrotreaters for desulfurization. These units are involved in six basic refining processes to produce the variety of products:

- *Sorting – fractional distillation*: crude oil is heated to 750 degrees; the fractionator separates into rough “cuts” according to boiling point ranges; the lightest compounds (fuel gas) vaporize and rise to the top of the fractionator; the heaviest materials (asphalt/residuals) remain a liquid and drop to the bottom
- *Breaking – cracking & coking*: fluidized catalytic cracking converts low-valued heavy fuel oil into gasoline, diesel and alkylation feedstock; it uses a powdered catalyst that acts like a liquid when fluidized with air; delayed coking converts residue (asphalt) into gasoline and diesel; petroleum coke is a solid byproduct blended with coal for use as fuel
- *Rearranging – reforming & isomerization*: catalytic reforming rearranges the shape of a gasoline molecule to improve the octane and liberate hydrogen; it uses a precious metal catalyst
- *Recombining – alkylation*: HF alkylation combines isobutene and olefins (from FCC & Coker) into high octane gasoline; it uses a hydrofluoric acid catalyst
- *Purifying – desulfurization & treating*: in these purifying processes impurities are removed using heat, pressure, hydrogen and catalyst in order to reduce harmful emissions from vehicles and refineries and to recover sulfur to use in other products like fertilizers
- *Product blending*: this combines “intermediate” products from fractionation, cracking, coking, alkylation, reforming and treating units into finished products; this process must meet product specifications such as octane, cetane, sulfur content, vapor pressure, flash temperature and boiling points

Interesting Facts

- *How much gasoline is in our largest storage tank?* 120,000 barrels or 5 million gallons converting to 333,333 fill-ups (a lifetime supply for 100 individuals)

- *How high is the pressure in our hydro treating units?* 1200 pounds per square inch (like a large cow standing on your thumb)
- *Besides fuels, what are some other uses for oil?* Producing petrochemicals such as synthetic fibers in clothing, waxes in candy bars, vinyl seat covers, lip gloss make-up, plastics, Teflon cooking wear, chewing gum, detergents, and medicines.

The presentation was followed by a walking tour of a portion of the refinery in which the CAC members and guests were placed in four groups, each with a tour guide.

NEXT MEETING: MAY 12

- Welcome/Introductions
- Pipeline Safety Presentation: Update on Pipeline Spills and Safety Measures (with speakers on river mitigation efforts and from the DEQ)
- Subteam Reports: Meet in Park & Southside Outreach
- Community, Transportation & Refinery Updates