

Alyeska's ballast water treatment facility modifications reduce hazardous air pollutants at the Valdez Marine Terminal

[EDITOR'S NOTE: In the last newsletter it was noted that by the end of 2010 Alyeska Pipeline Service Company expects to complete comprehensive modifications to its ballast water treatment facility located at the Valdez Marine Terminal that will substantially improve the facility's ability to reduce emissions of hazardous air pollutants. That article noted that a significant catalyst for the changes at the treatment facility derived from passage of the Oil Pollution Act of 1990 (OPA90) - specifically OPA90's provisions for phasing out single-hull tankers for use in U.S. waters by 2015. This change was responsible for a substantial reduction of oily ballast water for treatment at the ballast water treatment (BWT) facility at the Valdez Marine Terminal. [Part 1 was published in the July 31 issue of the JPO Newsletter. Down the Pipe, and is available online at: http://www.jpo.doi.gov/ Publications/JPO%20news.html.

Part two of this article discusses some events following the passage of OPA90, focusing on air quality and emissions – especially as they impact the terminal. The article concludes with a discussion of some of the significant modifications made by Alyeska to adapt to current conditions at the terminal and how these changes address hazardous emissions.

The BWT: OPA90 plus 19

In the 19 years since OPA90 was enacted important modifications to facilities in the terminal have been made in response to a combination of factors, including: improving safety, reducing emission sources of hazardous air pollutants, modifying existing facilities to conform to new regulations or safety procedures, and adjusting to new operating conditions. Modifications made at the tanker berths and the ballast water treatment facility proved to be especially important because these

(con't. on pg. 2)



(Top) construction work proceeds on BWT DAF cells; (left center) DAF cell processing influent; (right) empty DAF cell—images taken Spring 2009 at Valdez Marine Terminal by Mark Morones, JPO/SPCO Information Officer





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BLM combines compliance, monitoring and strategic partnerships to facilitate long-term improvements at the Valdez Marine Terminal

The Bureau of Land Management (BLM) is one of several agencies monitoring the Trans-Alaska Pipeline System (TAPS) through participation in the Joint Pipeline Office, a consortium of state and federal agencies that share a common mission to, "[R]egulate the Trans-Alaska Pipeline System ... in the best interests of the people of the nation and the State of Alaska. Safety, environmental protection, pipeline integrity, and regulatory compliance will be achieved through partnering with industry."

The Valdez Marine Terminal (VMT) is a critical component of the TAPS system and the BLM has a long history of monitoring Alyeska compliance within the terms and conditions of the federal grant of right-of-way. BLM exercises its compliance authority at the VMT. The agency's monitoring has focused on long -term improvements within the terminal, including efforts to reduce hazardous air emissions.

The Oil Pollution Act of 1990 (OPA 90) mandated the creation of citizens' councils for Prince William Sound and Cook Inlet to promote partnership and cooperation among local citizens, industry and government, and to build trust and provide citizen oversight of environmental compliance by oil terminals and tankers. The BLM is an Ex Officio member of the Prince William Sound Regional Citizens Advisory Council (PWSRCAC) and works closely with that organization on issues impacting the VMT and Prince William Sound.

Following the passage of OPA 90, the BLM tracked and analyzed the decline in dirty ballast water for treatment at the terminal's BWT facility due to the phase out of single-hull tankers. During the 1990s when the EPA was involved in developing rules to reduce hazardous air pollutants at the terminal, BLM personnel in Valdez worked closely with Alyeska

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BWT/BTEX part 2 (con't. from pg. 1)

facilities were significant sources of hazardous air pollutant (HAP) emissions.

Analysis of Two-Mile But

The National Emissions Standards for Hazardous Air Pollutants (NESHAP) are determined by the U.S. EPA for air pollutants not covered under the National Ambient Air Quality Standards (NAAQS). Pollutants identified under NESHAP may cause an increase in fatalities or in serious, irreversible or incapacitating illness. NESHAP pollutants require the maximum available degree of emission reduction that the EPA determines is achievable. In the late 1990s a new federal regulation was adopted to address tanker vessel loading operations, specifically those with associated volatile organic compounds (VOC) and hazardous air pollutants (HAP). (SEE 40 CFR parts 9 and 63 and subpart Y - National Emissions Standards for Marine Tank Vessel Loading Operations).

Loading crude into a tanker displaces flammable, hazardous gases that were contained in the tanker's crude oil tanks into the atmosphere. As a result of the EPA's adoption of standards for tanker vessel loading operations, Alyeska installed vapor control systems on berths four and five. The vapor control system performs three functions at the terminal. It: (1) generates oxygen-depleted blanket gas for the crude tanks and incinerate tank vapor emissions; (2) provides vapor control and incineration for crude tankers; and (3) utilizes gas to generate electrical power to the terminal.

Since the terminal began operations in 1977, the treatment facility has treated wastewater consistent with EPA and ADEC permit requirements. The largest component of wastewater is oily ballast water. Over time the change in the quantity and quality of the ballast water component of wastewater has necessitated change to the treatment facility.

In 1977, 112 million bbls of oil flowed through the TAPS. In 1988 over 744 million bbls of crude reached the terminal – the highest yearly flow of crude to be transported through the TAPS. (The Exxon Valdez oil spill and the passage of OPA90 took place during the highest oil throughput years for TAPS). In 2008, 234 million bbls of crude oil were off-loaded at the terminal. (NOTE: Valdez off-load volumes are less than North Slope volumes due to refinery off-take points and usage.)

This reduction in throughput has resulted in a significant decline in total tanker stops at the terminal, from 453 in 2000 to 284 in 2008. During this same time period, the quantity of oily ballast received at the treatment facility also dropped from 83.7 million bbls in 2000 to 14.3 million bbls in 2008.

These declines significantly impacted the ballast water treatment facility. Ballast discharge accounted for approximately 93 percent of the total wastewater processed by the treatment facility according to a 2004 report by Alyeska that addressed strategic reconfiguration for the Valdez Marine Terminal. Today there are greater time periods between

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Image of berth 5 showing oil and ballast water pipes—image taken by Mark Morones

BWT/BTEX part 2 (con't. from pg. 2)

tanker stopovers and a significant decrease in oily ballast effluent to be processed. This, in turn, will create challenges for the BWT facility.

At the same time that single-hull tankers were being phased out of service, awareness of water and air quality were topics of increasing public and private concern. The primary agencies charged with this regulatory oversight over air and water quality are the U.S. Environmental Protection Agency (EPA) and the Alaska Department of Environmental Conservation (ADEC).

Section 402 of the Clean Water Act requires that all discharges to surface waters must be permitted under the National Pollutant Discharge Elimination System (NPDES). Because the ballast water treatment facility discharges treated effluent into Port Valdez, Alyeska is required to obtain a NPDES wastewater discharge permit, regulated by the EPA. The latest permit is being renewed by the EPA.

In the late 1990s, as previously noted, the EPA adopted emissions standards for marine tank loading operations under NESHAP that resulted in vapor controls for berths at the terminal. The adoption of these new rules was supported nationwide and in Alaska by many individuals, coastal communities and citizens' advisory groups.

Alyeska was also aware of concerns over emissions at the terminal. In 1992 the company conducted its Valdez Air Health Study. According to Alyeska:

The Valdez Air Health study was an effort to determine the risk associated with air pollutants in the Valdez air shed. Monitoring stations for collecting air quality data were set up at the terminal and other locations. The information was not source specific in

(con't. on pg. 4)

BLM at VMT (con't. from pg. 2)

and PWSRCAC to ensure methodology and shared results for measuring emissions.

In early 2001 Alyeska planned on converting the storage tanks to use internal floating roofs (IFRs). Typically the space within an oil storage tank between the surface of the oil and the ceiling of the tank is filled with an inert gas (referred to as a "blanket") to reduce the potential for an explosive event. Crude tanks are connected to a vapor control system. This system collects and burns vapors as a power source. Excess vapors are burned. Alyeska considered using an IFR that would float directly on the surface of the crude within the storage tank. The IFR would rise or fall based on the current level of crude in the storage tank. The BLM prepared an environmental assessment (EA) as a prerequisite for Alyeska to proceed on this project. (Ultimately the project was placed on hold as part of a cost/benefit analysis performed by Alyeska.)

During 2004, both Alyeska and the U.S. Environmental Protection Agency (EPA) were engaged in developing or utilizing hazardous emissions models for wastewater (EPA used its WATER9 model while Alyeska implemented its Fate Study), and BLM staff in Valdez participated in the review and decision of the results. The BLM also performed field surveillances on the sampling protocols.

In 2006 Alyeska began its \$91 million effort to renovate the BWT plant. The BLM developed an environmental assessment on this project, which would reduce emissions from the modified BWT to the major source threshold of 25 tons per year by 2009. (The threshold is a determination of what level of emissions is permitted for a particular facility that is a source for hazardous emissions. The threshold level is determined under regulations established by the EPA.)

After the BLM issued a notice to proceed

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BWT/BTEX part 2 (con't. from pg. 3)

that emissions from various sources were not quantified from this data. There were no tests per se conducted to determine ballast water treatment emissions prior to 2003 as it was customary to use emission estimation methodology.

During the 1990s the Prince William Sound Regional Citizens Advisory Council (PWSRCAC) actively pursued emissions controls at the ballast water treatment facility and campaigned with the EPA to enact regulations requiring the reduction of hazardous air pollutants at the facility.

In 2002 the EPA issued a proposed "OLD" rule to the Federal Registry for NESHAP. ("OLD" stands for Organic Liquid Distribution). NESHAP-OLD provided specific exemptions for waste water and for "black oil," for example, oil that had an API gravity less than 40. API is one method of measuring specific gravity. In 2004 the EPA published its final ruling on NESHAP-OLD that eliminated the black oil exemption but kept the wastewater exemption (which includes ballast water).

Over the past ten years a lot of consideration has been given for reducing hazardous air pollutant (HAP) emissions at the treatment facility. In April 2005 Alyeska released its final report on the ballast water treatment system BTEX Fate Study. (BTEX is a subset of HAP emissions and stands for benzene, toluene, ethyl benzene, and xylene.) Alyeska commissioned the study to update its understanding of BTEX removal pathways in light of evolving operating conditions at the BWT facility. The study used site-specific test data to assign emissions estimates for the entire treatment facility. The study estimated that there were 44.86 tons of BTEX air emissions from the facility in 2003. (Total BTEX production at the BWT in 2003 was estimated at 171.5 tons. Another 127.9 tons were biologically produced and treated in the DAF cells and the biological treatment tanks (BTT).) The study forecasted declining BTEX emissions from 2004 through 2009 based on the predicted decline in ballast flows resulting from the conversion of the TAPS fleet to double-hull vessels. The study predicted a decline in hazardous air emissions from an estimated 37 tons/year in 2004 to 10 tons/year in 2009. The study also concluded that between 97-99 percent of BTEX entering the biological treatment tanks was biologically consumed. The study did not collect data or estimate emissions from the 90s (separation) tanks.

The WATER9 wastewater treatment model is general application software used by the EPA to analyze individual waste components in wastewater collection, storage, treatment and disposal facilities to estimate emissions. WATER9 is in the public domain and used extensively in the wastewater industry. In February 2004, using this model,

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Dan O`Barr, an Electrical Inspector with the State of Alaska, had pulled over while traveling on the Dalton Highway, north of the Brooks Range (and one mile north of Pump Station 4) where he managed to take these photos of one of the Google Earth Camera Cars.

Haze in top picture is caused by wildfires, which have ravaged Interior Alaska this summer.



BLM at VMT (con't. from pg. 3)

that allowed Alyeska to begin modifications to the BWT, the BLM consistently participated in and evaluated key renovations at the facility including:

- Vapor mitigation and downsizing of the DAF cells in 2006 -2007;
- Replacement of the biological treatment tank system with enclosed chemical gas strippers, and removal of one crude recovery and one separation tank in 2008-2009;
- Modification of the DAF system to use Induced Gas Flotation Systems in 2009-2010; and
- Monitoring the final configuration and permit renewal for the BWT during the 2010-2015 time period.

Over the past five years, BLM personnel have increased surveillances in the Valdez area from 103 in 2003 to 245 in 2007.



Alyeska employees working at pipeline mile post 792.5 to remove a large rock structure that had been pressing against an underground segment of the Trans-Alaska Pipeline. Photo taken by Justin Selvik, Natural Resource Specialist III, JPO/SPCO.

Sulfide Gulch Integrity Dig

Representatives from several agencies within the JPO, including the Alaska Department of Environmental Conservation (ADEC), the Bureau of Land Management (BLM) and the State Pipeline Coordinator's (SPC) office have conducted surveillances on pipeline integrity digs near the Valdez Marine Terminal over the past several months. In early July the latest integrity dig took place at PLMP 792.5 at Sulfide Gulch, located south of Keystone Canyon and just north of the Terminal. Alyeska employees excavated the area to remove a large rock that was pushing on the 48-inch pipe. Work crews successfully removed the rock structure and the pipe has been properly aligned. BLM monitors from the Valdez office report that the pipe is ready to be wrapped and the hole filled. An ADEC representative was on site to monitor water quality issues.



Containment material put in place to protect surrounding area. Photo taken by Justin Selvik, Natural Resource Specialist III, JPO/SPCO.

BWT/BTEX part 2 (con't. from pg. 4)

the EPA estimated that the ballast water treatment facility emitted 340 tons of HAPs per year. In December 2004 the EPA completed its model and reported that the facility emitted in excess of 200 tons of HAPS per year.

By 2004 a number of activities were starting to converge. Alyeska began developing a plan for strategic reconfiguration of the terminal and issued an environmental report on that topic in September 2004. The EPA finally adopted a formal rule on NESHAP-OLD exempting wastewater. In December the EPA issued its WATER9 report of the treatment facility that estimated higher emission levels than what Alyeska would report in its 2005 Fate Study. Despite the disagreement in the respective models it was clear that overall levels of hazardous air pollutants were decreasing.

Ballast Water Treatment, part 2

In October 2006 Alyeska notified the EPA and PWSRCAC that it planned to reduce emissions at the treatment facility below the major source threshold of 25 tons per year by 2009. There were a number of reasons to achieve this goal. The reduction in ballast water influent to the treatment facility meant that it would be difficult at the lower ballast flows to sustain sufficient levels of bacteria to break down crude within the biological treatment tanks. Alyeska was also eager to address the potentially explosive atmosphere that existed in the 80s and 90s tanks. Providing vapor controls on the 80s and 90s tanks would also reduce the total emissions from the treatment facility.

Another change involves the treatment facility's DAF cells. Originally the facility had six of these cells. That number was reduced to three. This was done as part of a multi-year maintenance process. By 2010 the facility will have two completely covered DAF cells. Several options are available to reduce hazardous BTEX emissions: the DAF cells can use an activated carbon bed filtration systems to reduce hazardous BTEX emissions or vapors can be routed to the treatment facility's two regenerative thermal oxidizers (RTOs). Both options provide emission controls. The DAF cell project replaced an earlier, temporary installation. Alyeska previously used flood weirs at the treatment facility to contain wastewater leaving the DAF cells enroute to the final effluent pipe leading to the biological treatment tanks. Ballast water pouring out of the DAF cells created a waterfall effect. The turbulence from these waterfalls released BTEX from the water solution. Flooding of the weirs was intended to minimize turbulence and reduce air emissions.

This spring Alyeska completed the installation of four gas strippers and two RTOs. The gas strippers will remove most BTEX from the raw ballast water. The BTEX is then routed to the RTOs for decomposition in the thermal oxidizers. The

(con't. on pg. 7)

Senate confirms Assistant Secretary for Land & Minerals Mgmt and BLM Director
On August 7 it was announced that the U.S. Senate confirmed Wilma Lewis as Assistant
Secretary for Land and Minerals Management. This office establishes Interior policies and
provides oversight to the Bureau of Land Management, Minerals Management Service, and
the Office of Surface Mining Reclamation and Enforcement. The assistant secretary oversees management of public lands and resources, including production of federal energy and
mineral resources, both onshore and on the Outer Continental Shelf.

On the same day, Bob Abbey (picture to right) was confirmed as Director of the Bureau of Land Management. Abbey has over 32 years of experience working with state and federal land management agencies. More information on the BLM and its new director is online at www.blm.gov. (Photo courtesy of the BLM)



Kanuti River Oil Spill Response Drill

Bill Haese, with the Alaska Department of Environmental Conservation, Bureau of Land Management (BLM) Operations & Maintenance Specialist Shawn Swanson, and BLM contractor Bonnie Friedman, evaluated a combined resources oil spill response drill south of Pump Station 5 at the Kanuti River on August 30.

Combined resource drills involve responders and equipment from multiple locations. In this case the locations included the Prospect Response Base, Yukon Response Base, Stevens Village Response Team and the Mobile Command Post "Go Team." The mobile command post (MCP) trailer was mobilized from Fairbanks.

The primary objective was to contain a spill and prevent it from reaching the flowing waters of the Kanuti River. This is a critical task since the Kanuti flows into the 1.6 million-acre Kanuti National Wildlife Refuge. Field responders established a functional on-scene command, established a staging area and deployed three task forces (one simulated).

The drill involved a <u>simulated</u> spill of 175 barrels of North Slope Crude. The response included river booming, water dams, skimmer operations, and decon setup. River boats, air boats and helicopter sling-load operations were used to reach off-road boom sites.

The response was evaluated by personnel from Alyeska, ADEC and BLM. The evaluation process has yet to be completed, but the objectives of both the field responders and MCP were successfully met.

(Photo above of river booming courtesy of Bill Haese, with the Alaska Department of Environmental Conservation/JPO)



U. S. Coast Guard to hold inaugural Alaska oil spill awareness seminar in Valdez on September 29, 2009

Commander Darryl Verfaillie, Captain of the Port for Prince William Sound, will host the first ever Alaska Oil Spill Awareness Seminar at the Valdez Civic Center on September 29, 2009. The seminar is designed as part of an outreach effort to provide key leaders, community stakeholders, industry representatives and journalists with an advanced understanding of oil spill response activities. The Coast Guard Marine Safety Unit (MSU) Valdez will partner with the Alaska Department of Environmental Conservation, the U.S. Environmental Protection Agency, Alyeska's Ship Escort Response Vessel System, National Oceanographic and Atmospheric Administration, Spiltec, SeaRiver Maritime, CHADUX, Tesoro, and the Law Office of Kevin Beauchamp Smith to present and discuss various topics, including: oil chemistry, multi-agency cooperative plans, control and containment, response/ recovery options and protection of sensitive areas. This seminar is designed as part of an outreach effort to provide key leaders, community stakeholders, industry representatives and journalists with an advanced understanding of oil spill response activities. MSU Valdez intends to make this an annual event to advance the education and understanding of oil spill response and prevention activities. For more information, please contact Lieutenant Matthew York at 907-835-7214 or by e-mail at: matthew.d.york@uscg.mil.

Public Notice of Jim River Boat Launch Proposed Decision

A public notice was published on August 10, 2009 in the Fairbanks Daily News Miner of a proposed decision to issue a right-of-way to Alyeska Pipeline Service Company for a boat launch on the Jim River. The right-of-way will be subject to the provisions of Alaska Statute 38.05.850. The purpose of the project is to establish reliable access to the Jim River for oil spill training and response. The site is located within Section 18, Township 23 North, Range 14 West, Fairbanks Meridian, AK. The proposed right-of-way is on the south bank of the Jim River, just northwest of the Alaska Department of Transportation and Public Facilities Jim River Maintenance Station at approximately Milepost 138 of the Dalton Highway. The notice may be viewed on the ADNR website at http://dnr.alaska.gov/commis/pic/pubnotfrm.htm under Public Notices, Jim River Boat Launch Proposed Decision.

The public is invited to comment on the preliminary decision. Any comments concerning the proposed action must be received in writing by the State Pipeline Coordinator's Office by 4:30 p.m. September 8, 2009 in order to ensure consideration. If no significant change is required to the Proposed Decision, it will be issued as the Final Decision after September 8, 2009 without further notice.

BWT/BTEX part 2 (con't. from pg. 5)

design also utilizes a hydrogen peroxide dosing system to treat the influent stream for hydrogen sulfide. This process is intended to remove many compounds, including sulfur dioxide from the RTO exhaust and to reduce hydrogen sulfide.

One of the biological treatment tanks was taken out of operation and placed on standby. This also reduced emissions.

Hazardous gases, primarily hexane gas, can accumulate within the head space of the 90s tanks. Hexane is potentially explosive and is considered a HAPS gas, so Alyeska installed vapor control on the 90s tanks to reduce the explosive atmosphere and to recycle the hexane-laden gas for use as an energy source at the terminal. This reduces the levels of explosive gases and cuts HAPS emissions.

Modifications of the treatment facility also included modernization of the 80s tanks, which are used as crude recovery tanks. One of the tanks (tank 81) was cleaned and placed on standby. Tank 81 is planned to remain out of service indefinitely. The second tank (tank 80) had a nitrogen-inerting system installed. Nitrogen is an inert gas, which, when injected into the head space of the tank, reduces the risk of an explosive event.

When asked what the effect would be of all these changes, Alyeska estimated that 2009 emissions for the entire BWT facility will be less than 10 tons per year of HAPS. This forecast is based on a decline in oily ballast water and adding the 90s tanks to the BWT's vapor control system. PWSRCAC's Project Manager for Terminal Operations, Tom Kuckertz, P.E., agrees that the changes made by Alyeska have had a significant impact on BTEX and HAPS reduction. He stated, "PWSRCAC believes that emissions at the ballast water treatment facility have been significantly reduced and we are in agreement with Alyeska's estimates of emissions being less than 10 tons per year and perhaps even less than five tons per year."

Even acknowledging the debate over predictions of the HAP emission models, it is apparent that modifications put into place by Alyeska over the past several years – especially through its efforts to utilize vapor controls coupled with the recent changes to the ballast water treatment facility – have made a profound and positive difference to improving air quality at the terminal.—END



JPO Management Team

STATE TEAM MEMBERS
Mike Thompson (DNR/SPCO)
State Pipeline Coordinator
DNR Liaison
Ron Doyel (ADEC)
DEC Liaison
Ray Elleven (ADOL/WD)
DOL Liaison
Dennis Gnath (ADF&G)
ADF&G Liaison
John Reeves (ADOT&PF)
ADOT&PF Liaison
John Cawthon (ADPS/SFMO)

ADPS/SFMO Liaison

FEDERAL TEAM MEMBERS
Jerry Brossia (DOI/BLM)
Authorized Officer
BLM Liaison
Jeffrey Walker (DOI/MMS)
DOI/MMS Liaison
Dennis Hinnah (DOT/PHMSA)
DOT/PHMSA Liaison
Matt Carr (EPA)
EPA Liaison
Cdr. Steven T. Pearson (USCG)
USCG Liaison
Michael Rabbe (USACE)