

# Volatile oil prices result from bad data and misguided attention to inventories

OPEC crude oil quotas were increased four times in 2000. During the first half of 2001, they were reduced twice. Ignoring the *IEA Oil Market Report* has been a technical advance, but the obsession with weekly reports from API remains a destabilizing market factor

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Weekly reports by the American Petroleum Institute (API) on crude and product stocks were once highly useful, but under current conditions, they cover less than 20% of total inventory. It really does not matter what U.S. inventories are at any given time. However, reality does not prevent the press and brokerage houses from devoting immense attention to API reports.

Given the obsession with changes in stocks, OPEC's strategy for stable prices is to keep stocks constant and vary quotas with seasonal changes in demand. When the members get "stuck" on a low-quota number, as they did in 1999, they create strong upward pressure on prices. It remains to be seen how long the process will take in 2001 and how soon, or if, it can be corrected.

## FAULTY STATISTICS

Largely by default, the monthly *Oil Market Report (OMR)* compiled by the International Energy Agency (IEA) has become the source of oil balances—not only for the financial community, but also for the industry itself. The recent history of the industry according to *OMR* is depicted in Table 1.

The large positive balancing items usually are termed "missing barrels" because they are, in concept, increases in

stocks in nations that are not members of OECD. In 1997 and 1998, the balancing items were 1.0 and 1.7 million bbl per day (MMbpd), respectively. Since the end of 1996, the volume of oil "missing" in *OMR* balances is nearly 1.5 billion bbl.

There are, of course, no missing barrels. A basic problem is that *OMR* sets itself a hard task by use of the deliveries basis in its oil balances—and then does it badly.

## STATISTICAL CONCEPTS

The simple basis for oil balances is to begin with production, i.e., the *Production Basis*. In the production basis, deliveries for a country or area are obtained by the formula:

$$\text{Deliveries} = \text{Production} + \text{Net Trade} + \text{Change in Stocks}$$

The more difficult method is to begin with deliveries of refined products and gas liquids, or the *Deliveries Basis*. The formula for determining balance is:

$$\text{Deliveries} = \text{Production} + \text{Net Trade} + \text{Change in Stocks} + \text{Processing Gain}$$

Using the deliveries basis, there is no balance unless the processing gain is correct.

Refineries convert crude oil, condensate and gas liquids into useful products such as gasoline, naphtha, jet fuel, diesel, residual fuel oil, lubricants, wax, asphalt, coke, etc. In addi-

Table 1. OMR oil balances, million bpd

	1999	2000	2001	
			1Q	2Q
<b>Demand</b>				
OECD *	47.7	47.8	48.8	46.6
Other	27.2	27.8	27.9	28.2
Demand	74.9	75.6	76.7	74.8
<b>Supply</b>				
OPEC crude	26.6	27.9	28.4	
OPEC gas liquids	2.8	2.9	2.9	
Non-OPEC	43.0	44.2	44.6	44.4
Processing gain	1.7	1.7	1.7	1.7
Supply	74.1	76.7	77.6	
<b>Stocks up (or down)</b>				
OECD *	(0.8)	0.1	(0.1)	
Other	(0.1)	—	—	
Balancing item	0.1	1.0	1.0	

\* United States, Europe, Japan, Korea, Mexico, Canada, Australia and New Zealand

Table 2. Processing gains, million bpd

	1997	1998	1999	2000
United States	0.85	0.89	0.89	0.95
Canada	0.08	0.06	0.06	0.07
Mexico	0.04	0.04	0.04	0.06
Western Europe	0.62	0.64	0.60	0.61
OECD Pacific	0.31	0.31	0.32	0.33
<b>OECD Subtotal</b>	<b>1.90</b>	<b>1.94</b>	<b>1.91</b>	<b>2.02</b>
Eastern Europe	0.27	0.26	0.26	0.26
China	0.17	0.17	0.18	0.21
Other Asia	0.20	0.21	0.22	0.23
Middle East	0.12	0.12	0.12	0.11
Latin America	0.19	0.21	0.22	0.22
Africa	0.07	0.07	0.07	0.07
<b>World</b>	<b>2.92</b>	<b>2.98</b>	<b>2.98</b>	<b>3.12</b>

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Table 3. Production in 2000, million bpd

	OMR	World Oil	Oil & Gas Journal
Saudi Arabia	8.00	8.32	8.26
Kuwait	1.77	2.06	2.10
U.A. Emirates	2.24	2.41	2.23
7 members	13.34	13.65	12.92
<b>Subtotal</b>	<b>25.35</b>	<b>26.44</b>	<b>25.51</b>
Iraq	2.57	2.68	2.57
OPEC crude	27.92		28.08
OPEC NGL	2.88		1.54
<b>OPEC</b>	<b>30.80</b>	<b>29.12</b>	<b>29.62</b>
United States	8.11	5.80	7.74
Mexico	3.45	3.11	3.45
Canada	2.74	1.58	2.73
Western Europe	6.78	6.34	6.75
Eastern Europe	8.12	7.93	8.22
Latin America	3.77	3.48	3.45
China	3.23	3.23	3.42
Asia	3.12	2.71	3.01
Africa	2.86	2.53	2.44
Middle East	2.00	1.95	2.00
<b>Total</b>	<b>74.98</b>	<b>67.78</b>	<b>72.83</b>

Table 4. Production in 2000, million bpd

	Total	Crude Oil	Condensate	Gas Liquids
Saudi Arabia	9.20	8.14	—	1.06
Kuwait	2.16	2.00	—	0.16
U.A. Emirates	2.61	2.17	0.20	0.24
7 Members	13.82	12.09	0.77	0.96
<b>Subtotal</b>	<b>27.79</b>	<b>24.40</b>	<b>0.97</b>	<b>2.42</b>
Iraq	2.58	2.49	—	0.09
<b>OPEC</b>	<b>30.37</b>	<b>26.89</b>	<b>0.97</b>	<b>2.51</b>
United States	7.75	5.82	0.02	1.91
Mexico	3.30	2.88	0.08	0.34
Canada	2.73	2.02	—	0.71
Western Europe	6.81	5.92	0.44	0.45
Eastern Europe	8.34	7.86	0.25	0.23
Latin America	3.43	3.24	0.05	0.14
China	3.14	3.14	—	—
Asia	3.01	2.27	0.34	0.40
Africa	2.74	2.54	0.11	0.09
Middle East	1.93	1.84	0.05	0.04
<b>Production</b>	<b>73.55</b>	<b>64.42</b>	<b>2.31</b>	<b>6.82</b>

Table 5. OPEC quotas in 2000, million bpd

	1Q	2Q	3Q	Oct.	Nov. & Dec.
Algeria	0.73	0.79	0.81	0.84	0.85
Indonesia	1.19	1.28	1.32	1.36	1.39
Iran	3.36	3.62	3.73	3.84	3.92
Libya	1.23	1.32	1.36	1.40	1.43
Nigeria	1.88	2.03	2.09	2.16	2.20
Qatar	0.59	0.64	0.66	0.68	0.69
Venezuela	2.72	2.85	2.93	3.02	3.08
<b>Subtotal-7</b>	<b>11.70</b>	<b>12.53</b>	<b>12.90</b>	<b>13.30</b>	<b>13.56</b>
Saudi Arabia	7.44	8.02	8.26	8.51	8.67
Kuwait	1.84	1.98	2.04	2.10	2.14
U.A. Emirates	2.00	2.16	2.20	2.29	2.33
<b>Subtotal-10</b>	<b>22.98</b>	<b>24.69</b>	<b>25.40</b>	<b>26.20</b>	<b>26.70</b>
Iraq	2.72	2.71	2.70	2.70	2.70
<b>Crude Oil</b>	<b>25.70</b>	<b>27.40</b>	<b>28.10</b>	<b>28.90</b>	<b>29.40</b>

tion to the international trade in crude oil, condensate and gas liquids, there is extensive commerce in refined products.

Aside from the small amounts of hydrogen that may be added, the refining processes do not change the weight of

the hydrocarbons refined. Many of the processes (cracking, reforming, etc.) result in products that are less dense than the input. The volume of products from a refinery—not their weight—typically exceeds the volume of the input of crude oil, condensate, etc., by 1% to 6%, depending upon the combination of processes employed. The difference between output and input volumes is termed *Processing Gain*. The recent history of processing gains is shown in Table 2.

Statistics in the United States and Canada are by volume and include processing gains. There are no reported processing gains elsewhere because statistics are kept by weight. They are easy enough to calculate after conversion from metric tons to barrels.

OMR's figure for processing gains (1.7 MMbd) is ridiculously low. Because of that error, OMR has to overstate production or understate "demand." In practice, OMR does both, but not by enough to avoid the balancing item.

#### PRODUCTION AND QUOTAS

The production of oil has three categories:

- Crude oil—This mixture of hydrocarbons exists in liquid phase at reservoir conditions of temperature and pressure.
- Condensate—These hydrocarbons are in a gaseous state at reservoir conditions, but condense to the liquids state at surface standard conditions.
- Gas liquids—Ethane, propane, butanes and natural gasoline are components of natural gas along with methane, its primary component. They are separated from the methane in processing plants using various technologies.

OMR regularly "finds" more production than the traditional industry sources. Table 3 shows a comparison of OMR figures with those from *World Oil* and *Oil & Gas Journal* (OG&J) for year 2000.

IEA also is a statistical agency. Using the data in its *Oil, Gas, Coal & Electricity Quarterly Statistics* and other sources, production can be estimated as shown in Table 4.

During 2000, OPEC operated with the five sets of quotas listed in Table 5.

Actual OPEC production of crude oil was closer to the figures listed in Table 6.

Evidently, the group's seven members' capacity to produce crude oil is something close to 12.4 MMbpd. There are at least two reasons why the seven accept quotas higher than capacity:

1. They have projects in the works that may allow the quota to be used in the future.
2. Prices may turn out to be higher than other members expect.

When OPEC was operating with quotas of 20 MMbpd or less, fraud was rampant with the objective of understating actual production. Most OPEC members still do not provide accurate statistics. Fraud continues, but its usual purpose is to overstate production. It is easy to do because OMR and the trade press are careless about the distinctions between crude oil, condensate and gas liquids.

#### DELIVERIES AND DEMAND

The proper way to construct an oil balance is to follow the flow of crude oil and products. For the last three years it has been as shown in Table 7.

Stated on the deliveries basis, the resulting balances become those in Table 8.

Millions of consumers took pains to begin the year 2000 with full tanks in their cars, trucks, houses, etc. Normally, consumers' tanks are a little over half full—just as are all the storage tanks used to operate the oil industry.

The shift from industry to consumer storage at the end of

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Table 6. OPEC crude in 2000, million bpd

	1Q	2Q	3Q	4Q
Algeria	0.77	0.79	0.81	0.83
Indonesia	1.12	1.13	1.14	1.10
Iran	3.35	3.36	3.33	3.32
Libya	1.27	1.26	1.25	1.22
Nigeria	1.84	1.90	1.98	2.05
Qatar	0.55	0.64	0.66	0.69
Venezuela	2.89	2.93	3.04	3.14
<b>Subtotal-7</b>	<b>11.79</b>	<b>12.01</b>	<b>12.21</b>	<b>12.35</b>
Saudi Arabia	7.43	7.96	8.52	8.65
Kuwait	1.84	1.98	2.04	2.14
U.A. Emirates	1.97	2.15	2.23	2.32
<b>Subtotal-10</b>	<b>23.03</b>	<b>24.10</b>	<b>25.00</b>	<b>25.46</b>
Iraq	2.26	2.67	2.75	2.28
<b>Crude Oil</b>	<b>25.29</b>	<b>26.77</b>	<b>27.75</b>	<b>27.74</b>

1999 amounted to approximately 136 million bbl. In oil statistics, Y2K produced an unusual pattern of deliveries—77.51 MMbpd in the fourth quarter of 1999, followed by only 75.34 MMbpd in the first quarter of 2000 (Table 9).

Over a year, 136 million bbl averages a little less than 0.37 MMbpd.

#### INVENTORIES

Crude oil and refined products are moved from place to place in batches by ships, pipelines and trucks. Tankage and inventory are part of the cost of doing business. The industry's usual objective is to minimize those costs. Over the course of a year, changes in the industry's stocks can be

Table 7. Petroleum trade, million bpd

	1998	1999	2000
<b>Production</b>			
Crude	63.91	62.82	64.42
Condensate	2.03	2.14	2.31
Gas Liquids	6.43	6.57	6.82
<b>Production</b>	<b>72.37</b>	<b>71.53</b>	<b>73.55</b>
<b>Deliveries</b>			
Exports of crude			
OPEC	(19.95)	(19.72)	(20.74)
Other	(7.38)	(8.54)	(8.36)
Imports of crude			
OPEC	0.27	0.45	0.48
OECD	20.37	20.82	21.32
Other	6.61	7.02	7.22
Exports of products			
OPEC	(4.92)	(4.82)	(4.78)
Other	(1.77)	(2.53)	(2.85)
Imports of products			
OPEC	0.13	0.10	0.11
OECD	3.30	3.96	3.81
Other	3.34	3.26	3.79
Stocks down (or up)			
OECD	(0.26)	0.78	(0.12)
Other	(0.24)	0.55	(0.41)
<b>Deliveries</b>	<b>71.87</b>	<b>72.86</b>	<b>73.02</b>

expected to be small numbers, absent some unusual event like Y2K. It is also reasonable to expect that the direction of change is the same both inside and outside OECD—the reasons for the change apply to both.

Consistent with Table 8, total stocks at the end of 2000

Table 8. Oil balances, million bpd

	1997	1998	1999	2000
Adjusted Deliveries				
OECD	46.24	46.25	46.50	47.17
Other	27.98	28.60	28.97	29.34
<b>Subtotal</b>	<b>74.22</b>	<b>74.85</b>	<b>75.47</b>	<b>76.51</b>
Y2K Effect	—	—	0.37	(0.37)
<b>Deliveries</b>	<b>74.22</b>	<b>74.85</b>	<b>75.84</b>	<b>76.14</b>
Supply				
OPEC Crude	26.15	26.75	25.99	26.89
OPEC NGL	3.13	3.29	3.31	3.48
Non-OPEC	42.28	42.33	42.23	43.18
Processing Gain	2.92	2.98	2.98	3.12
<b>Supply</b>	<b>74.48</b>	<b>75.35</b>	<b>74.51</b>	<b>76.67</b>
Stocks up (or down)				
OECD	0.30	0.26	(0.78)	0.12
Other	(0.04)	0.24	(0.55)	0.41

Table 9. Y2K effect, million bpd

	1999 4Q	2000 1Q
United States	0.37	(0.38)
Canada	0.04	(0.04)
Mexico	0.02	(0.02)
Western Europe	0.28	(0.29)
Eastern Europe	0.08	(0.08)
Japan	0.20	(0.20)
Korea	0.07	(0.07)
Australia/N.Z.	0.02	(0.02)
China	0.06	(0.06)
Other Asia	0.13	(0.13)
Latin America	0.09	(0.09)
Africa	0.04	(0.04)
Middle East	0.08	(0.08)
<b>Y2K Effect</b>	<b>1.48</b>	<b>(1.50)</b>
Adjusted Deliveries	76.03	76.84
<b>Reported Deliveries</b>	<b>77.51</b>	<b>75.34</b>
Y2K Effect	Million bbl 136	(136)

were not much different from what they were at the end of 1996, as the comparison in Table 10 illustrates.

An inventory of around 4.8 billion bbl can be taken as a comfortable operating level for the industry in the midst of the heating season. After holding quotas at 23.03 MMbpd for a year, it took OPEC four quota increases in 2000 for the industry to get back to this level. Once it was reached, prices dropped sharply.

Weekly reports by the American Petroleum Institute (API) on crude and product stocks were once highly useful to the Railroad Commission of Texas. Under current conditions, they cover less than 20% of total inventory. Trying to judge what is happening to total stocks based on changes in the United States is a hazardous exercise.

However, API statistics remain the only “real time” data available. Last fall, there was great concern about heating oil because stocks were “low.” This spring, there was more of the same concerning gasoline. The sequel in both cases was an increased volume of imports.

Distillation capacity of refineries in the world is about 81.5 MMbpd vs. production of 66.7 MMbpd of crude oil and condensate in 2000. Given the excess capacity, it is virtually impossible to have a “shortage” of any product anywhere in the world.

Refineries in the U.S. run close to capacity, because the U.S. is a large, net importer of gasoline, heating oil and residual fuel.

Table 10. Estimated stocks, million bbl

	As of December 31				
	1996	1997	1998	1999	2000
United States					
Industry	941	997	1,076	926	927
SPR	566	563	575	567	541
Western Europe	1,256	1,255	1,303	1,232	1,260
Other OECD	828	874	830	776	819
<b>Subtotal</b>	<b>3,591</b>	<b>3,689</b>	<b>3,784</b>	<b>3,501</b>	<b>3,547</b>
Other on land	424	396	471	279	397
Ships	835	860	870	860	890
<b>Total</b>	<b>4,850</b>	<b>4,945</b>	<b>5,125</b>	<b>4,640</b>	<b>4,834</b>

Table 11. OPEC quotas in 2001, million bpd

	Jan.	Feb. & Mar.	2Q
Algeria	0.85	0.80	0.77
Indonesia	1.39	1.31	1.25
Iran	3.92	3.70	3.55
Libya	1.43	1.35	1.30
Nigeria	2.20	2.08	2.00
Qatar	0.69	0.65	0.63
Venezuela	3.08	2.90	2.79
<b>Subtotal</b>	<b>13.56</b>	<b>12.79</b>	<b>12.29</b>
Saudi Arabia	8.67	8.19	7.86
Kuwait	2.14	2.02	1.94
U.A. Emirates	2.33	2.20	2.11
<b>Total</b>	<b>26.70</b>	<b>25.20</b>	<b>24.20</b>
Iraq	2.70	2.70	2.70
<b>Crude Oil</b>	<b>29.40</b>	<b>27.90</b>	<b>26.90</b>

Although the imports come from all over the world, the largest volumes are from Venezuela and refineries in the Caribbean.

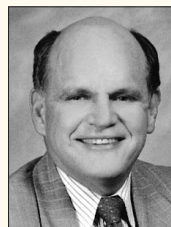
When it is time to increase output of heating oil or gasoline, it gets done at refineries outside the U.S. and loaded into ships. It really does not matter what the inventories in the U.S. are at any given time. However, reality does not prevent the trade press and brokerage houses from devoting immense attention to API reports.

## PROSPECTS

It matters a great deal, of course, how much crude oil the members of OPEC are producing. Quotas for the first half of 2001 are listed in Table 11.

As this is written, OPEC is committed to keeping quotas unchanged in June and July, then reducing them in September 2001. That is reminiscent with what was done in 1999, and a big change from 2000—when quotas for the ten members were increased to 25.4 MMbpd vs. 24.7 MMbpd in the second quarter. In 2000, actual OPEC production increased by nearly 1.0 MMbpd in the third quarter because of unilateral action by Saudi Arabia. wo

## THE AUTHOR



*George S. Littell has been a partner of the firm Groppe, Long & Littell since 1976. Over the last 20 years, this firm has accurately predicted price and supply and demand movements, including the sudden jump by crude prices to \$20/bbl by mid-1999. Successor to a firm founded in 1995, Groppe, Long & Littell has its offices in Houston.*