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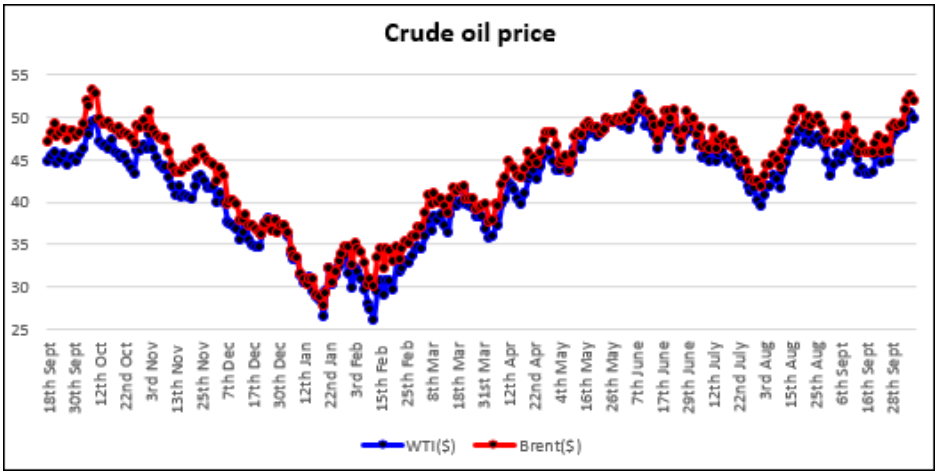
Some of the news items for this week are as follows:



- Crude oil prices gained ground this week and the share prices for shale explorers also gained strength, which is good and bad news. The rig count in the US has been increasing, and the increasing oil prices will only encourage it.

- Industry analysts and observers are still not sure if OPEC will honour its agreed decision of implementing production cuts up to between 32.5 and 33 mb/d at their November 30th meeting in Vienna. If the deal goes through, it would reduce the production by 500 mb/d to 980 mb/d in 2017. Some analysts think OPEC took this decision out of compulsion, considering the financial condition of some member countries, which have been tested for their patience. To keep the solidarity of the member countries intact, the decision was taken in haste. Should it go forward, Saudi Arabia will need to sacrifice some production. Nigeria and Libya have been exempted from cuts to given them room for expansion, and both countries are likely to restore production after disruptions that they have had. Also keep in mind that the member countries have not adhered to any quotas in the recent past. Besides, the oversupplied market will take some time to digest the production cuts, so that the crude prices start ramping up. But then the resiliency of US drillers is another concern, as they are likely to go back and drill the shales, and enhance production, which will push the prices down again. So, at present there is valid skepticism in the industry, and in abundance. A significant part of the puzzle is Russia, which is watching these developments closely. While it has assured the OPEC that it will cooperate, apparently, it is not too hopeful that the crude prices will come up significantly. The Russians are still preparing their budgets based on the oil price as $40.

- Iran has also been able to get concessions from the OPEC, when it made their decision to restrict production to between 32.5 and 33 mb/d. Iran is well on its way in planning for increasing the country's production levels. It has been in discussion with different companies for investments that can boost their oil export potential.

- Goldman Sachs has predicted that the crude price will stay at $55, which will encourage shale drillers to go back to work. Besides, Nigeria and Libya are likely to increase their production in 2017, and so the market will remain oversupplied.

- The last two years have seen oil companies engaged in shale drilling reduce their costs and improving efficiency in the face of $45 crude oil price and less. This has happened in part by deploying new technology. But when it comes to Canadian oil-sands producers, there is not a whole lot that they can do. With $45 oil price, they have been cutting down to the maximum, and barely surviving as there is nothing more that can be done significantly, when it comes to oil sand development requiring facilities to mine and process bitumen. These companies have been reducing labour and non-essential maintenance and spending on garbage trucks and road repairs, to cope with the low oil prices. The recent increase in the crude oil price will help them heave a sigh of relief.

- We hear about drones a lot these days, and their applications have been increasing lately. They can be seen flying over a construction site where a pipeline is being laid down, where they snap high-res images and send them back to the control devise. Drone applications to E & P sector is likely to witness growth as cost reduction measures. Some companies are considering applications of drones for monitoring infrastructure, examining leaks and spills, or conducting inspections using infrared cameras or other sensors. Various experiments are being conducted to test many such applications. One interesting application tested recently was the delivery of a small packet launched in foggy weather from a barge and delivered to a tanker, and it went off successfully. Such applications when fully operational are likely to save time and cost.

So much for the industry news this week.

For the lighter side this week

In a recent blog post, I had shown some pictures of trees changing colour in the fall. Fall and autumn are the words that are used interchangeably, with the more formal English usage preferring the latter, and the former being the more informal choice for the North Americans, giving a reference to the falling leaves in this season. I'll like to discuss the changing colour of the leaves in the autumn, which I do below.

As the Earth completes its annual journey around the Sun, we get to enjoy the four seasons at more or less regular intervals, i.e. the *spring, summer, autumn and winter*. Due to the changing seasons, we experience variations in the lengths of days and nights and the temperature and moisture. The variation in these parameters have an influence on the plants and trees we see around us. We see the plants beginning to show new leaves and buds in the spring, keep blooming and flowering all through the summer, then start changing colour in the autumn, and finally fall off in preparation for the winter. So, how does it work? Why does all this happen?

As we all studied in high school, the green pigment in the plants and trees is called *chlorophyll*. Chlorophyll absorbs light from the Sun, which serves as energy to convert the carbon dioxide and water into oxygen and carbohydrates. The carbohydrates serve as food for the plants and trees. Chlorophyll itself is an unstable substance and is continuously broken down inside the plant cells. So, it needs to be

synthesized continuously, for which sunlight and warm temperatures are required. During the spring, or the growing season, chlorophyll is continuously being produced and broken down, and so the plants look green.

Besides this green pigment chlorophyll, which is produced by the plants in abundance, plant cells also produce other pigments called *carotenoids* and *anthocyanins*. The carotenoids are bright yellow and orange and seen on the fruits and vegetables, such as corn, carrots and bananas. The anthocyanins add the red colour to the plants, such as seen in cranberries, red apples, strawberries and plums. While chlorophyll and carotenoids are produced in the spring, the anthocyanins are produced only in the autumn, when the right conditions for its synthesis are met.

During the spring, the chlorophyll production goes full bloom. Even though the carotenoids are present, the chlorophyll dominates and so the plants appear nice and green. In the autumn season, the lengths of the days shorten and nights are longer. Consequently, the production of chlorophyll slows down and the already available carotenoids as well as the newly produced anthocyanins are unmasked, and so show their colours. Not all plants and trees have equal measures of the pigments, and thus we see a variation in these colours in the autumn.

Trees in our backyard with their leaves yellow (left) and another one with its leaves reddish yellow (right)

Also, a fine layer of cells is formed at the base of each leaf which gradually closes off the fine vessels that transport fluids to and from the leaves. Due to this the sugars produced during the day cannot be transported from the leaves to the branches and the trunk. The trapped sugars present in the leaves are now transformed into anthocyanins. Anthocyanins give their leaves shades of red, purple and crimson. When the fluids in the leaf vessels are completely sealed, the leaf is ready to fall.

Some perennial plants and trees survive the winter due to some natural toughening up characteristics, in that some leaves or foliage have some kind of wax coating, which helps them withstanding cold temperatures. In other plants the fluids in their cells contain substances that resist freezing.

Did you know?

… where is the world's largest railway station and what is it called?

It is the **Grand Central Terminal** in **New York**. It is the largest by the *number of tracks* and the *number of platforms*. Every day, over 750,000 people pass through Grand Central. It opened on Sunday, February 2nd, 1913 and so is over 100 years old.

So much for this week! Till the next post, stay safe and happy!