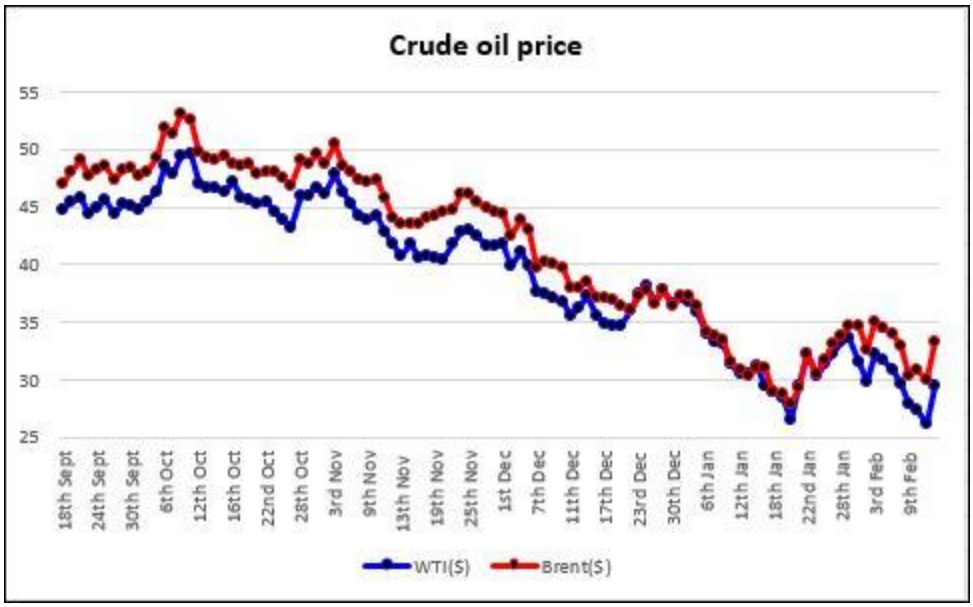
Post 13th February, 2016

Some of this week's oil and gas industry round up includes the following items:



1. Crude oil prices this week have fluctuated in the $26 and $30.

2. It was another week where the crude oil price dipped below $30 as the global stockpiles continued to increase. The US oil storage levels have also reached their 80-year highs. The rumours about an emergency OPEC meeting saw the oil price gain some ground and rose above $29.

3. The CAPEX cuts by oil and gas companies, or delayed investments has been estimated to have reached $1.5 trillion. Such a staggering figure suggests that future oil supplies would be much lower than what they would have been otherwise.

4. As I have mentioned before, several small companies in North America are looking at going bankrupt due to the high debts they are in and the low oil price is prohibiting them from making payments.

5. Repsol decided to shut down the Varg oilfield in the North Sea due to the low oil price. The producing field had become cash negative in August 2015.

6. Many oil companies have announced cuts in their dividends. These include ConocoPhillips, Anadarko, Chesapeake Energy, Noble Energy, Marathon Oil, EnCana and some others. It is expected that some other companies will follow suite.

7. Husky Energy in Calgary announced that as part of its cost cutting measures, it had laid off employees this week, but did not reveal the number. Unofficial sources put the figure at 500. TransCanada (Canadian pipeline-company) posted $2.5b loss in Q4 of 2015 and has announced that it would have more layoffs in 2016. This has been due to the $2. b impairment charge for the Keystone pipeline that US has refused to give permission to. Cenovus Energy also announced that it would have more layoffs in the coming weeks or months, after its loss of $480.3 m Q4 loss.

Meanwhile, BP announced this week that it would lay off 4000 employees over the next two years which includes 600 job losses from BP's North Sea facilities.

8. OPEC production may increase in the coming months as Iran has entered into a deal with Total to supply 160,000 b/d into Europe.

9. The monthly OPEC report has indicated that the oil supply will exceed demand by 720,000 b/d in 2016, which is higher than 530,000 b/d quoted in the previous report. This will have a further impact on the already low oil prices.

For the lighter side this week:

Just as we talk of red, blue and green as colours, are black and white also colours?

The other day our daughter suggested that I write about black and white colours, as she had come across this question.

I remember teaching this in my Physics classes at school, before I joined ONGC back in 1984. Before we answer this question we have to clarify how colours are created. The colours of objects we see around us are generated or formed by pigments or colouring agents for those colours. For example, an apple is seen as red as its skin contains a red coloured material or chemical. Similarly, if a painting shows an apple, it shows up as red because some red pigment was used to paint it.

Now let us examine the other case, i.e. when we view an image on a TV screen or a computer monitor. There images are formed with coloured light. The electronic system in the TV produces light of red-coloured wavelength which shows up as red on the screen. To understand all this in more detail, one needs to distinguish between *'primary'* and *'secondary'* colours, and also if we are talking about pigments or light.

In the case of light, red (R), green (G) and blue (B) are the primary colours. A combination of these coloured lights produces a different coloured light. For example R and B produces yellow (Y), R and B produces purple, and B and G produces cyan. If R, G and B lights are added, we see white light. Sunlight is white light and it exhibits a rainbow, or when passed through a prism shows the colours of the spectrum. In other words, if the colours of the spectrum are added, they produce white light. If we are standing in photographic dark room, and there is no light, everything appears black. Thus absence of light shows up as black. *Black therefore is no colour.*

Thus as answer to the question we started off answering, if we are talking about light, yes white is a colour, but black is not a colour.

If we are talking about pigments there are three primary colours, i.e. red, blue and yellow, which are so called as they cannot be created by mixing other colours. Primary colours can be mixed together to form secondary colours. For example, red and yellow are mixed to produce green, red and blue produces purple, and red and yellow produces orange. Green, purple and orange are secondary colours. We remember this from our school days in our art/painting classes.

If we combine R, Y and B paints, we produce a dark coloured muddy black pint (may not be jet black, but will be close). Thus if we are talking about pigments, *black is a colour,* white is not.

When pigments are mixed or combined, they absorb the combination of their colours and reflect less. This is why such mixing of colours results in a darker colour. For example on a white background, if red is coated, it masks other colours and reflects only red colour. Similarly, G and B mask other colours and reflect G and B colours respectively. In this sense it is subtractive colour mixing, subtractive as the wavelengths are subtracted from the light that is reflected. This is the traditional model of printing. More recent colour printing model uses cyan, magenta and yellow colours as well as black. It is referred to as CMYK model, K is for black. It does not use the letter B as it is commonly used for blue colour. A combination of C, M and Y yields black.

I remember seeing this firsthand when I generated the first coloured plot at GEOPIC, ONGC in 1987 when the first colour plotter was installed there along with the mainframe IBM3083 computer. It used to have provision to roll the paper on the top of the plotter in addition to the paper roll inside. On plotting, the paper would come out first with the black imprint on it, and get rolled on the top. Then it would get rolled back inside the plotter and again come out with the cyan imprint on the earlier black imprint. The same process would be repeated for the magenta and yellow colours. The coloured plot would look complete after the yellow imprint. It was fun generating the pseudo impedance coloured plots at the time.

The next thing to discuss is how are we able to see colour on different objects. As stated above, we see any colour because of the light reflected from a given object. When sunlight or white light falls on a given object, it absorbs the wavelengths of all colours and reflects the wavelength of the colour it shows. A red rose in a garden absorbs wavelengths of other colours in white light and reflects only the wavelength of red color. A white object reflects wavelengths of all colours and a black object absorbs wavelengths of all colours of visible spectrum and reflects nothing.

Strictly speaking a black object may be reflecting some but very little light, but in physics a blackbody is considered a perfect absorber of light. That is why an astronomical body such as a planet or star in our galaxy is called a black hole as it absorbs all light and nothing gets reflected off it.

Finally, how do our eyes see colour? The visible spectrum forms part of the electromagnetic spectrum. When electromagnetic waves interact with matter, there is energy transference. This can happen when some of the energy in the wave matches the energy that the particles of matter can absorb. When the wavelength of a given colour enters our eyes, the receptors (cones on the retina) in there respond to it. In fact there are three types of receptors in our eyes, some sensitive to red, some to blue and others to green colour. The signals from these receptors are interpreted by our brain in the form of colour. When white light enters our eye, it triggers the red, blue and green sensitive receptors in the right proportion, so that the brain interprets the colour as white. Similarly, when red light enters the eye, the red receptors are triggered but not the green and blue, so the brain interprets the colour as red.

For a grey colour, the levels of R, G and B colours or their intensity is lowered, and so instead of white, we see grey colour. If the intensity of light entering our gets reduced to a point such that none of the receptor cones get triggered, we perceive black colour.

Thus for light, white is a colour and black is not counted as a colour. This is how we reason it out in physics.

Did you know?

Earth is the only place in the solar system where a total solar eclipse can happen.

I hope you find these interesting.

So much for this week!

Till the next post, stay safe and happy!