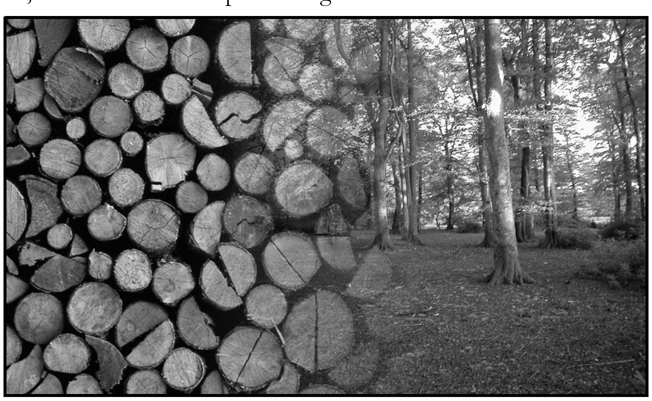
5 Production

Why it's not just 'a pool'

OIL production seems fairly straightforward: countries pump out the oil as fast as they can and then it runs out. This is the implication between the R/P ratios (see the "Glossary") that are so beloved of oil companies and imply that oil will last for many decades to come. The problem with R/P ratios is that oil does not work like that.

Woodpile v Woodland

Oil production can be best understood by comparison with something such as wood. Imagine an island where there is one carpenter. The R/P ratio basis of oil usage revolves around the assumption that oil production works like a woodpile in the carpenter's backyard. Whenever he needs wood, he walks out to the pile and takes however much he requires. If things get busy and he needs more wood, he simply takes more wood from the pile. There is always enough to satisfy his needs until that fateful day when he removes the last plank and it is then all gone. The only factor in its price is demand – if fewer people want wooden things, the carpenter lowers the price to stimulate demand. If he has plenty of work on, he can increase the price and get the benefit.



Comparing this with oil, if the world has 1,050 Gb of oil remaining and we use 27 Gb a year, then dividing one by the other means that we will be able to use 27 Gb of the woodpile for another 39 years. Then the yard will suddenly turn out to be empty.

But oil does not sit in one huge hole in the ground, constantly being pumped out. Rather an oil field is a set of wells of different sizes, with new wells being set up as old ones dry out. The R/P ratio takes the view that the oil has already been found and is sitting patiently in the backyard. In reality, it is more like woodland than a woodpile.

If we imagine instead that our carpenter had to chop down a tree every time he needed to make something, the problems become more evident. Trees vary in their size, proximity and quality. Initially our man would pick those that were large, of good quality, and nearby. As this was relatively easy, his prices could be kept low. But, as time went on, he would have to cut more trees of smaller sizes, travel further to find them and use wood of a lower standard. This extra work would take longer and naturally result in higher prices. Eventually, unless the trees were managed and replaced, he would find himself unable to find enough wood to satisfy his customers.

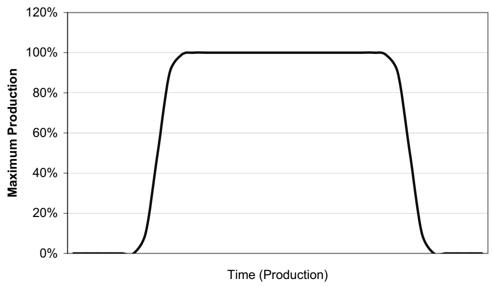
But couldn't he cut the trees quicker to keep production up? He certainly could employ someone to help him (which would be like drilling more wells) but that would result in depletion occurring more quickly, and the quicker you cut away the large and nearby trees, the quicker you have to resort to the small and distant ones. New technology can only help so much however; no matter what circular saw or four-wheeled vehicle you have, there's always a certain minimum time needed to cut down and drag a tree to the workshop. Production still falls, the best you can do is change the angle of the slopes on the chart of production. Any increase in production means a gentler initial decline and a steeper subsequent one.

Oil production works in a similar way with the important distinction that, unlike trees, we cannot replace the oil we use. It is as if every tree the carpenter cut down was gone forever.

Such is oil production. Chart 5.1 overleaf shows how the R/P suggests oil production might occur, as a woodpile view. An individual well might resemble that but fields are formed of many wells. Chart 5.2 is a more 'sophisticated' version, the one often assumed by economists that oil production can simply be increased to keep pace with consumption until the wells finally and suddenly run dry.

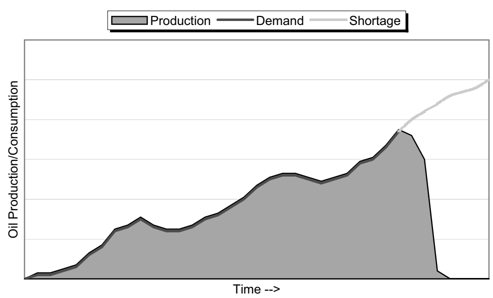
Chart 5.3 shows how it actually works, as a woodland. (In reality, because discoveries do not come along at perfectly placed times, and there are always political and economic effects, the smoothness of the curve gets somewhat warped. In particular, the right hand half tends to get stretched out (see chart 5.4). But the principle remains.)

The production curve for the US lower-48 (see chart 4.2 in "Discoveries") shows this curve in effect. Also, by looking at the production curve for the whole world (chart 5.5), we can see how, up until the mid 1970s, the curve was a remarkably accurate reproduction of the theoretical curve. Then political elements interfered to



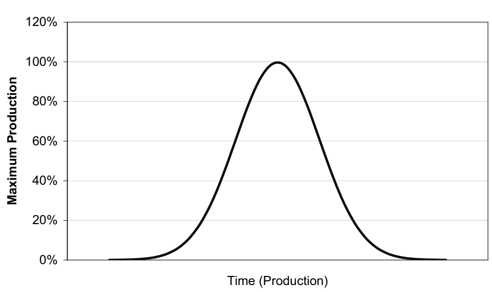
5.1 Oil Production Curve (assumed from R/P)

This is how many people (including 'experts') assume that oil is produced from using the R/P ratios. Like a woodpile, there is a fairly constant flow until near the end when it suddenly drops. Actually, a single well is not unlike this (see the Hubbert Curve chapter) and natural gas does flow somewhat similar. But it is nothing like an actual oil field or area.
Source: diagrammatic



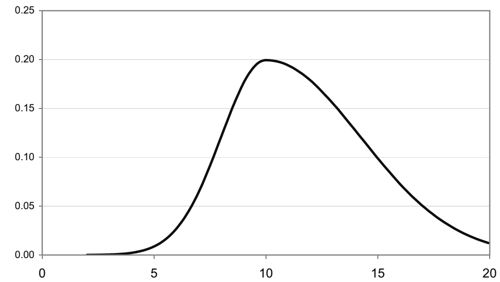
5.2 Oil Production Curve (Flat-Earth Economics)

Other experts, notably economists, assume that oil production follows this type of curve. As demand increases, the oil fields simply increase production, the two lines rising and falling together. Those who admit that oil is finite (and not all do) expect that the end will come suddenly as the oil fields simply run out. This is often known disparagingly as 'flat-earth economics'.
Source: diagrammatic



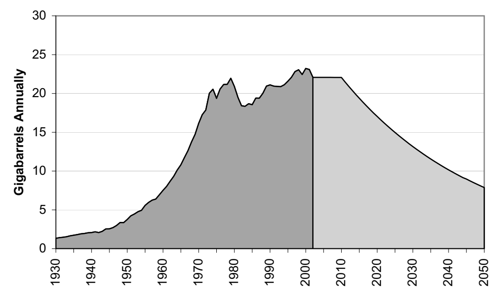
5.3 Oil Production Curve (actual in theory)

Unlike Charts 5.1 and 5.2, this is closer to how the production of an oil field or region progresses. This though is only theoretical as there are other external matters which influence it.
Source: diagrammatic



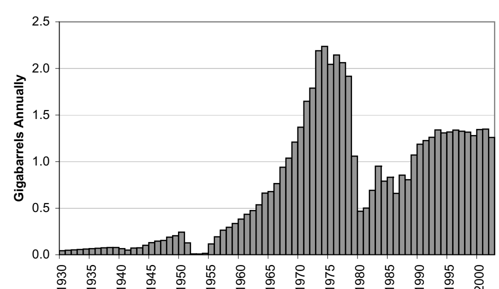
5.4 Oil Production Curve (actual and adjusted)

The symmetrical curve of Chart 5.3 is often skewed like this. For an individual area, it often turns out to be cheaper to buy oil from elsewhere rather than extract the difficult remains after the peak, so reducing the downslope angle. In the case of world production, there will be nowhere else to go and it will be declining prosperity after the peak that will reduce demand.
Source: diagrammatic



5.5 Oil Production (World) 1930-2050

This chart shows world oil production up until 2002 with ASPO's predictions of what might occur afterwards. After a plateau, it is expected to drop away (although it won't be as smooth as shown, of course). The comparisons with the Hubbert Curve are clear until the 1970s when the OPEC-induced oil crisis messed up the slope.
Source: ASPO



5.6 Oil Production (Iran) 1930-2002

Iran's oil production was following the Hubbert Curve until the late 20th Century when revolutions (1979) and wars (1980-88) hit output. Because of this gap, the peak has become lower and longer.
Source: ASPO

balk the trend (see "The 1970s Oil Shocks" on page 3). The result was economic recession and a reduction in consumption. Less oil used meant a reduction in production with the consequent 'mountain range' that we see in the chart. In some ways though, this reduction was actually a good thing for, if we had not reduced our production and consumption in the 1970s and 1980s, we would now be sliding down the decreasing slope and well on our way to disaster.

The Financial Aspect

Many objectors to peak oil claim that, as oil becomes more expensive, more reserves will become available because they are then financially worthwhile. For example, if the price of oil on the world markets is $25 a barrel and it costs $30 to extract it from a particular oil field, that field will not be worthwhile and therefore not classed as "recoverable resource" (see "Referring to Oil Resources" in the Glossary). If the oil price rises to $35, then that oil becomes viable. The argument goes that, as oil production falls, the price rises and more oil becomes available.

This is true to a certain extent (although there will not be that much extra oil available). What it ignores is the fact that the new oil will not be *cheap* oil. The price will remain high and continue to rise, and everything else will rise in tandem – electricity, fuel, plastics, food. What follows will be recession, unemployment, financial collapse. As is often pointed out (and often ignored) the problem that faces us is not the end of oil, but the end of *cheap* oil, and the end of our cheap energy society.

The Hubbert Curve

It is not pure chance that we found a curve that fitted production. The work was done by an American geologist, M King Hubbert, who predicted in 1956 that the US-48 oil production would peak in 1969. He was much reviled at the time yet he was out by just one year.

The Hubbert Curve (as it is now known), is a statistical figure formed by combining many independent producing fields into a single trend. But real oil production does not always follow the curve. If discovery is intermittent or if the statistic covers a limited number of fields, it will look different. Many countries, for instance, display several peaks because oil has to be found before it can be produced. If the country has several discovery cycles, the production curve will mirror it.

Because the US-48 production has been uninterrupted, its production curve closely follows the Hubbert Curve, as we saw in chart 4.2 on page 12. Iran's output, though initially trying to follow the curve, has been disrupted by revolutions and wars, and so is breaking into two peaks.

(To see mathematically how the Curve is actually formed, see "The Hubbert Curve" on page 29 and "Hubbert's Peak Mathematics" on page xix.)

Previous Forecasts

At the beginning of this book, I mentioned the writer who said that "I remember being told twenty years ago that there was only twenty years of oil left". This is a common belief among uninformed people. It is where the title of this book comes from. It is also misleading.

There were indeed many claims during the 1970s that oil would run out by the end of the (20th) century or even before. But there was also a common prediction that oil production would *peak* around the end of the century, not run out, and this was the view taken by almost all reputable organisations. It now appears this prediction would have been extremely accurate if it wasn't for the slowdown in production caused by the 1970s oil shocks. People remember the forecasts but, because they are unaware of the difference between oil peaking and oil exhaustion, they assume that all the predictions were that oil would run out by 2000.

One site on oil depletion (http://www.oildepletion.org/roger/index.htm) gives a fascinating chart of oil predictions from the past thirty years. These are detailed on page 18.

So many of the forecasts from the past were accurate and remain so. To correct my writer's quotation:

> *I remember being told thirty years ago that oil would peak in thirty years. We are now being told again that oil will peak in the next ten years. I wonder if they will be saying "I told you so" in another thirty years!*

T5.1 Past Oil Predictions

Date of Forecast	Source	Forecast Date of Conventional Peak	Assumed Ultimate
1972	ESSO	"Oil to become increasingly scarce from the year 2000"	2100 Gb
1972	Report for the UN Conf. on Human Environment	"likely that peak production will have been reached by the year 2000"	2500 Gb
1974	SPRU, Sussex University	n/a	1800–2480 Gb
1976	UK Dept of Energy	Peak: "about…2000"	n/a
1977	Hubbert	Peak: 1996	2000 Gb (Nehring)
1977	Ehrlich et al.	Peak: 2000	1900 Gb
1979	Shell	"…plateau within the next 25 years."	n/a
1979	BP (Oil Crisis...again?)	Peak (non-Communist world): 1985	n/a
1981	World Bank	"...plateau around the turn of the century"	1900 Gb
1995	Petroconsultants	Peak: 2005	1800 Gb
1997	Ivanhoe	Peak: 2010	~ 2000 Gb
1997	Edwards	Peak: 2020	2836 Gb
1998	IEA: WEO 1998	Peak: 2014	2300 Gb ref. case
1999	USGS (Magoon)	Peak: ~ 2010	~ 2000 Gb
1999	Campbell	Peak: ~ 2010	2000 Gb (inc. polar deep)
2000	Bartlett	Peak: 2004 or 2019	2000 or 3000 Gb
2000	IEA: WEO 2000	Peak: "Beyond 2020"	3345 Gb (from USGS)
2000	2000 US EIA	Peak: 2016-2037	3003 Gb (from USGS)
2001	Deffeyes	Peak: 2003-2008	~ 2000 Gb
2002	Smith	Peak: 2011-2016	2180 Gb
2002	Nemesis	Peak: 2004-2011	1950-2300 Gb equiv.