

# Madagascar Tsimiroro Oil field Exploration, Production and ways to Export it to other countries.

## Natural Reserves (historical overview)

### 1. Introduction

Portman Management Consultants produced the following report focusing on the Madagascar oil field reserves and in particular the Tsimimoro field. The presence of very large reserves of crude in various locations on and near Madagascar have been known since the 1930s. However, it is only in recent times that serious efforts have been made to devise a means to monetise them. This is because the crude is very heavy indeed. In some fields (Such as the Tsimiroro field Block 3104) it can only be produced in the form of tar sands. In others, it is a liquid but a very heavy and viscous one. On the other hand, it is in very shallow reservoirs and is, in terms of contaminants, benign. In particular, it is very low in sulphur (sweet) and therefore of high value. In particular in the Tsimimoro field it estimated to have 900-1100 Million bbls recoverable. This has an average market value of \$60 Billion.

### 2. Production

Additionally, the very shallow depth of the reservoirs means that they can be drilled using very lightweight drilling equipment, thus reducing the cost of extraction.

Madagascar Oil Ltd. (MOL) which was founded in 2004 identified the Tsimiroro field, located towards the South West of the island, about 120 km east of the small port of Maintirano as the most attractive and potentially prolific prospect. The oil field also has the advantage of being close to two smaller fields, Tsimiroro South and Tsimiroro South West which, contain light crude. This was considered potentially to be suitable for blending with the heavy oil of the main Tsimiroro field to yield a lighter blended product of higher value and ease of transportation.



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### 3. Exploration

Two means of operating the wells were trialled, both proving successful:

a) The simpler method uses a single well bore, drilled with a short vertical section (due to the shallow location of the reservoir) followed by a longer horizontal section. The well is operated in a cyclical mode ("Huff and Puff") whereby the well is steamed for a period followed by a production period when the steam is removed and the well is allowed to flow to the heel from where it is pumped to the surface using a rod pump.

b) The more complex method uses a twin bore (usually in an over/under configuration). This is drilled again with a short vertical section followed by a longer horizontal section. In this method, the well is operated on a continuous basis whereby the steam is permanently injected into the lower bore and production is continuously pumped from the heel of the upper bore. An additional rod pump may be needed in the lower bore to clear the well of the condensed water from the injected steam.

Some years back now In 2005/6, a number of wells were drilled in the main Tsimiroro field and it proved possible to produce using steam assisted wells. Due to the very shallow location of the pay zone, the wells were drilled using a coring rig rather a conventional drilling rig. This afforded a considerable saving in the drilling costs. The steam to run the wells was produced from boilers burning produced crude. Steam from the boilers was also used to heat the tanks to which the production was routed.

### 4. Export of Crude to the Coast

There are 3 main ways to export the produced oil from Tsimiroro as follow

#### a) Heated Pipeline to Maintirano

The first method MOL's considered was to install a heated pipeline from the field to the coast. It would involve multiple reheat and booster pump stations with concomitant requirements for fuel or power supply. This approach would appear uneconomical at anything like the production rates envisaged. The crude oil would also be required to be Dhow?? Loaded onto a tanker moored approximately 20 km off the Madagascan coastline.

#### b) Insulated / Reheated Trucks

The second method was to truck the crude to the coast. A road route exists with the initial section out of Maintirano having been built as part of a Chinese aid project.

For trucking to other port locations truck reheating stations using steam injected through coils in the truck products tanks would need to be used. This would probably however rule out using heated / reheated trucks for the longer Thomasine route with the truck count multiplied by four to allow for the extra distance.

#### c) Use of Diluent

Another method considered was the use of a diluent blended with the crude to lower the temperature at which the crude oil would remain pumpable.

Suitable diluents would include lighter crudes and cheaper refinery products such as straight run kerosene or naphtha. Ideally therefore, the diluent should be sourced at the refinery to which the crude oil would be delivered. Initial studies identified the Mombasa refinery as the closest option but it may be shut down an alternative refinery could be at Fujairah.

### Conclusion

The Tsimiroro field has great potential and would bring considerable revenue to the country. Portman Management consultants can advise any potential investors and the Government in order for the field to reach the potential of 80-100 thousands of barrels a day (bbl/d) and advise on the major infrastructure build up which is required locally for storing the oil- including roads, pipelines and an upgrade to the country's Port.

Portman Management Consultants can produce feasibility studies to show the most viable options on how the Natural Oil Reserves can resourced to become the driving force of the local economy.