

TUNGSTEN

Introduction

Tungsten is a metal of strategic importance in times of war and is essential for the industrial development of the country. Tungsten is heavy (Sp. Gr.19.3) and highly refractory metal (melting point 3422°C). It has good corrosion resistance, good thermal and electrical conductivity and low coefficient of expansion. At temperature above 1650°C, it has the highest tensile strength of all metals. The major sources of tungsten are minerals scheelite (CaWO_4) and Wolframite $[(\text{Fe},\text{Mn})\text{WO}_4]$. It is a hard steel-gray shiny metal.

Tungsten is mainly used in the manufacture of ferro-tungsten and in certain non-ferrous alloys. These alloys are used for high speed tools, cutting tools, etc. Tungsten is also used in making filament in electrical lamps.

Tungsten occurs either as scheelite or wolframite in granite/pegmatite and quartz veins. The only experience of producing tungsten ore in the country is from Degana area of Nagaur district, Rajasthan and Chendapathar in West Bengal. The area was mined first by RSMDC and then by HZL till recent past. Presently, there is no production of tungsten ore in the country due to economic non-viability.

Basis of Grade Classification

The tungsten ore is converted into WO_3 concentrate and then marketed for manufacture of various products. Therefore the reserves/resources have broadly been classified into ore and contained WO_3 .

The concentrate specifications for commercial purpose are determined in terms of WO_3 content. Any concentrate with 65% or more WO_3 content is

considered saleable material. However low grade concentrate can also be used to make intermediate product provided the product can be obtained at an economic cost.

In Degana area of Rajasthan & Chendapathar, West Bengal, the minimum economic grade of tungsten ore considered was 0.1% WO_3 content for production of saleable concentrate. Incidence of WO_3 in the tungsten ore in the different areas of the country is as under :

At Degana, Rajasthan, out of 7 blocks minimum and maximum value of WO_3 was noticed 0.09% & 1.62% respectively. At Balda of Sirohi district, Rajasthan, average WO_3 content ranges from 0.24 to 0.48 per cent. In Dewa-Ka-Bera of Sirohi district the average WO_3 is 0.03% and in Udwarya of Sirohi that is 0.27%. In West Bengal, Bankura deposit contains on an average, 0.1% WO_3 . In Kuhi-Khobana-Agargaon belt of Maharashtra, GSI has estimated resources in Sakoli basin in Bhandara and Nagpur district, Maharashtra. The analysis showed 0.01 to 0.19% WO_3 in Kuhi block, 0.13 to 0.38% WO_3 in Khobana block and 0.48% WO_3 in Pardi-Dahegaon-Pipalgaon block. Gold ore at Mysore mine of BGML in Karnataka has been reckoned as a potential source of scheelite. The tailing dumps at Kolar Gold Fields (as per NMI sheet available) contain about 0.01 to 0.05% WO_3 .

Basis of Categorisation of Resources

As per United Nations Framework Classification (UNFC), resources are broadly classified into 'reserves' and 'remaining resources'.

According to the norms of this system, resources of tungsten ore and corresponding contained WO_3 have been placed under feasibility (211), pre-feasibility (222), measured (331), indicated (332), inferred (333) and

**Table - 1 : Reserves/Resources of Tungsten as on 1.4.2015 (P) vis-à-vis 1.4.2010
(By Lease Status/Grade)**

Lease status/Grade	(In tonne)					
	Reserves		Remaining resources		Total resources	
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
All India : Total						
Ore	-	-	-	87387464	87387464	No change
Contained WO₃	-	-	-	142094.35	142094.35	No change
Freehold						
Ore	-	-	-	87387464	87387464	No change
Contained WO₃	-	-	-	142094	142094	No change

figures rounded off.

reconnaissance (334) of remaining resources category.

Salient Features of the Inventory

The total resources of tungsten ore in the country as on 1.4.2015 are estimated at 87.39 million tonnes containing 142.1 thousand tonnes WO_3 . The entire estimated quantity has been placed under remaining resources category are in freehold areas.

All India scenarios of tungsten reserves, remaining resources and total resources as on 1.4.2015 vis-a-vis 1.4.2010 is given in Tables - 1 and 2. The tables give an idea about the significant

changes if any in terms of increase and decrease of resources as per lease status, grade and states. In Table-3 district-wise reserves/resources as on 1.4.2015 have been given.

Of the total resources, Karnataka is leading with 36.68 million tonnes ore (42%) containing 6.2 thousand tonnes of WO_3 , Rajasthan 23.93 million tonnes ore (27%) containing 93.7 thousand tonnes of WO_3 , Andhra Pradesh 14.80 million tonnes ore (17%) containing 20.26 thousand tonnes of WO_3 . Remaining 14% resources are in Maharashtra, Haryana, Uttarakhand, Tamil Nadu and West Bengal.

Table – 2 : Total Resources of Tungsten as on 1.4.2015 (P) vis-à-vis 1.4.2010 (By States)

(In tonne)			
State	Total Resources		Net Change
	As on 1.4.2015	As on 1.4.2010	
All India : Total			
Ore	87387464	87387464	No Change
Contained WO ₃	142094.35	142094.35	No Change
Andhra Pradesh			
Ore	14802300	14802300	No Change
Contained WO ₃	20262.57	20262.57	No Change
Haryana			
Ore	2230000	2230000	No Change
Contained WO ₃	3568	3568	No Change
Karnataka			
Ore	36677818	36677818	No Change
Contained WO ₃	6235	6235	No Change
Maharashtra			
Ore	8077250	8077250	No Change
Contained WO ₃	16035	16035	No Change
Rajasthan			
Ore	23928294	23928294	No Change
Contained WO ₃	93707.94	93707.94	No Change
Tamil Nadu			
Ore	250000	250000	No Change
Contained WO ₃	50	50	No Change
Uttarakhand			
Ore	658000	658000	No Change
Contained WO ₃	705	705	No Change
West Bengal			
Ore	763802	763802	No Change
Contained WO ₃	1530.84	1530.84	No Change

figures rounded off.

NATIONAL MINERAL INVENTORY - AN OVERVIEW

A total 21 deposits (freehold) have been covered in National Mineral inventory as on 01.04.2015. Of the total resources of tungsten, about 42 million tonnes (48%) have been estimated

under inferred (333) & reconnaissance (334) categories. These resources are based on limited & preliminary exploration. If these resources are explored, further, the confidence level of resource estimation may improve.

Table - 3 : District wise Reserves/Resources of Tungsten as on 1.4.2015 (P)

(In tonne)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total			
Ore	-	87387464	87387464
Contained WO₃	-	142094.35	142094.35
Andhra Pradesh			
Ore	-	14802300	14802300
Contained WO₃	-	20262.57	20262.57
Godavari (East)			
Ore	-	14802300	14802300
Contained WO₃	-	20262.57	20262.57
Haryana			
Ore	-	2230000	2230000
Contained WO₃	-	3568	3568
Bhiwani			
Ore	-	2230000	2230000
Contained WO₃	-	3568	3568
Karnataka			
Ore	-	36677818	36677818
Contained WO₃	-	6235	6235
Gadag			
Ore	-	300000	300000
Contained WO₃	-	360	360
Kolar			
Ore	-	33675889	33675889
Contained WO₃	-	4392	4392
Raichur			
Ore	-	2701929	2701929
Contained WO₃	-	1483	1483
Maharashtra			
Ore	-	8077250	8077250
Contained WO₃	-	16035	16035
Nagpur			
Ore	-	8077250	8077250
Contained WO₃	-	16035	16035
Rajasthan			
Ore	-	23928294	23928294
Contained WO₃	-	93707.94	93707.94
Nagaur			
Ore	-	23775123	23775123
Contained WO₃	-	93179	93179
Sirohi			
Ore	-	153171	153171
Contained WO₃	-	528.94	528.94

(Contd.)

NATIONAL MINERAL INVENTORY - AN OVERVIEW

Table-3 (Concl.d.)

State/District	Reserves	Remaining Resources	Total Resources
Tamil Nadu			
Ore	-	250000	250000
Contained WO₃	-	50	50
Madurai			
Ore	-	250000	250000
Contained WO₃	-	50	50
Uttarakhand			
Ore	-	658000	658000
Contained WO₃	-	705	705
Almora			
Ore	-	658000	658000
Contained WO₃	-	705	705
West Bengal			
Ore	-	763802	763802
Contained WO₃	-	1530.84	1530.84
Bankura			
Ore	-	763802	763802
Contained WO₃	-	1530.84	1530.84

figures rounded off.