



## Steel Slag Asphalt



Application of waste, arising from different industrial processes, to make various products is important from different aspects.

Helping in protection and maintenance of Irreplaceable resources, decrease in Environmental pollution and recycling consumed energies during the production of such waste, are among the objectives of the use of these materials.

Slags are the byproduct of steel and iron factories which are most often accumulated as large depot (Several million tons) around these factories. Over the years extensive worldwide researches have been done about consumption of this material and Several contexts for this purpose have been proposed. One context that can use slags in large volumes, is using them as aggregates in production of asphalt. Among the advantages of slags high compressive strength and abrasion, High internal friction angle, angular corners and rough surface can be noted that can be used in different layers of road pavement.

### Advantages:

- Usage of waste material at very low cost
- Decrease in the usage of natural resources and mineral
- At least 20 percent improvement of the asphalt properties and lifespan
- Rather Simple and practical technology
- Having a very long history of application in different countries

### Disadvantages:

- Increase in using bitumen in slag asphalt than normal asphalt
- Usage of specified grading range of slag materials in asphalt
- Increase in asphalt specific weight and as a result the asphalt transport costs



### Steel Slag Warm Asphalt



More than half a century, extensive studies has been made around the world for the using of slag in various civil fields. Slag is a by-product of iron and steel factories. One of the aspects of using slag is as a substitute of aggregate in asphalt mixtures. Studies show the positive effect of this substance on the performance of asphalt mixtures. In addition to this positive effect, due to the slag higher heat capacity than the aggregate, energy consumption in producing slag asphalts are more than asphalts that made with aggregate. On the other hand in recent years, new technology known as warm mix asphalt has been introduced that leads to reduction of asphalt mix temperature.

Extensive researches and studies of this company with the aim of using WMA technology in steel slag mix asphalt in order to reduce energy consumption, led to the introduction of steel slag warm mix asphalt new and unique production technology. In the asphalt produced by this company, slag asphalt production temperature reduces (around 25 ° C), so it compensates the increase of energy consumption due to slag high thermal capacity, any certain changes in the manufacturing process is not required. Therefore, the amount of energy consumption (fuel) in asphalt plants is reduced, the possibility of producing slag asphalt has been provided and also the depreciation of asphalt plant has been reduced. These benefits lead to at least two percent reduction in slag asphalt production costs.



### Rubber Asphalt



Every year governments pay a huge cost for road construction and repairing cracked and worn asphalts. Bitumen and similar compounds, that are extracted from oil, are Considered as asphalt raw materials. A study on these materials shows that asphalt cracking and fatigue can be prevented by adding polymeric materials to asphalt and this will lead to a significant increase in roads lifespan and so their operating life. The purpose of this technology is to increase quality of bitumen and service life of asphalt mixtures and therefore it would decrease the costs of maintenance and repairing costs dramatically and even some environmental problems will be reduced. The use of polymer for modifying the properties of bitumen that is used for road pavement is growing in recent decades. So that, road operators make a significant increase in road life and so the operational life of the road by using modified bitumen in asphalt. The studies of this company on the mentioned subject, results in an invention of using rubber powder technology as a polymeric material to improve the properties of bitumen and therefore asphalt. In this type of bitumen, by increasing compatibilizer materials between the particles of rubber powder and bitumen, bitumen structure become completely homogeneous and uniform and all its characteristics compared to conventional bitumen will be improved. For example, test results on the asphalt produced by this company, shows the improvement in number of asphalt tolerated cycle in dynamic creep test and this expresses more appropriate behavior of this mixture against road traffic and heavy loads. Adding rubber powder also decreases the depth of asphalt mixtures rut and this shows asphalt behavior improvement in very hot weather conditions. Rubber powder is produced from recycling old tires, wastes reduction and will help cycle of materials in nature.



## Stone Mastic Asphalt (SMA)

The main idea of production of stone mastic asphalt is based on the conjunction among aggregates. In fact in this type of asphalt the content of coarse aggregates is increased by changing the gradation of asphalt, results in an increase in the ability of asphalt to bear loads on the roadway.

[Stone mastic asphalt](#) is in need of a preservative in the mixture due to its higher bitumen content and higher content of coarse aggregates. For this reason special fibers are used for stabilization, reinforcement, and homogenous dissemination of asphalt mixture. Fibers known as Cellulose fibers will be directly added to mixer and after dissolving of the cover of the fibers in mixing temperature and break down of the structure in effect of shear force of the aggregates, they form complex network which prevents bitumen from egression. In the following, fibers cause in delay in aging and fatigue of bitumen.

### **Advantages:**

Increase in durability and lifespan of asphalt specially in heavily trafficked roads

Decrease in asphalt damages

Decrease in noise pollution in compare with normal asphalt

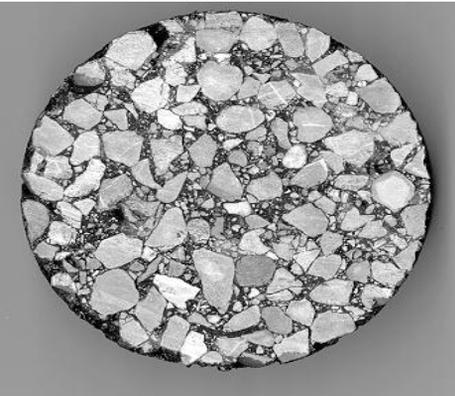
30 -50 percent improvement in asphalt features

Rather Simple and practical technology

### **Disadvantages:**

Increase in consumed bitumen

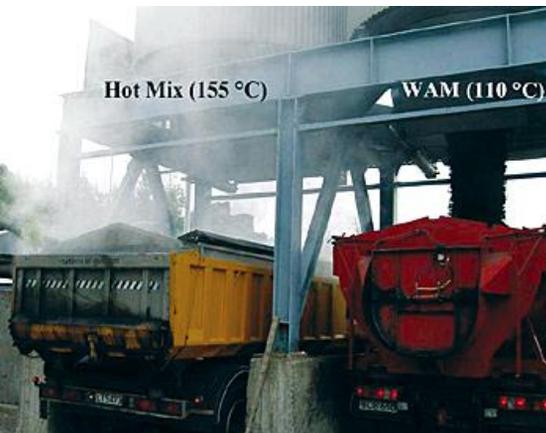
Increase in production costs as a result of more bitumen and usage of corrective fibers





## Warm Mix Asphalt (WMA)

High energy consumption, difficult environmental regulations and increasing environmental concerns about asphalt traditional production method with the name of Hot Mixture Asphalt (HMA), results in an invention of new asphalt production technology called Warm Mixture Asphalt (WMA). The logic behind this technology is to reduce the production and application temperature of asphalt mix. The most important benefits of this temperature degradation are reduction in energy consumption and emissions during production and implementation of asphalt. In recent years, extensive research has been done to develop and use this technology. Extensive research and studies of this company on the above subject, led to invention of new and unique warm mixture asphalt production technology. The asphalt produced by this company does not require any certain changes in the manufacturing process while reducing production temperature (approximately 20 ° C). Therefore, the amount of energy consumption (fuel) reduced in asphalt plants, producing and distribution of asphalt has become possible for more time period in a year, depreciation of asphalt factories is lower than before and also has far less cost than other hot mixture asphalt production technologies. Important note about this technology is having far less production cost than hot mixture asphalt that can lead to annual savings of 400 billion Rials in the asphalt industry in the country.



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### Natural Asphalt

Gilsonite or Asphaltum , Natural asphalt is similar to a hard petroleum asphalt and is often called a natural asphalt, asphaltite, uintaite, or asphaltum. Gilsonite is soluble in aromatic and aliphatic solvents, as well as petroleum asphalt. Due to its unique compatibility, Gilsonite is frequently used to harden softer petroleum products. Gilsonite in mass is a shiny, black substance similar in appearance to the mineral obsidian. It is brittle and can be easily crushed into a dark brown powder. Gilsonite is found below the earth's surface in vertical veins or seams that are generally between two and six feet in width. The veins are nearly parallel to each other and are oriented in a northwest to southeast direction. The vein will show up on the surface as a thin outcropping and gradually widen as it goes deeper. Due to the narrow mining face, Gilsonite is mined today, much like it was 50 or 100 years ago, the primary difference is that modern miners use pneumatic chipping hammers and mechanical hoists.



Gilsonite is used as a performance-enhancing agent for asphalt mixes. Gilsonite can partially or totally replace, or complement, the use of polymers in modified asphalts at a fraction of the cost. Gilsonite-modified asphalts have higher stability, reduced deformation, reduced temperature susceptibility and increased resistance to water stripping than non-modified asphalts. Gilsonite is also used to make both solvent-based and emulsion pavement sealers with superior appearance and weathering properties.