Part 7

ENERGY SAVING

7.3. New sealing and fire-proof materials for power enterprises

7.3.8. Experience of implementing materials of "Graphlex" series and their cost efficiency

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The sealing pieces from graphite foil "Graphlex" (gland seal rings) are used for high-pressure power accessories since 1994 at thermal power plants of RAO "UES of Russia". Nowadays they are used almost at all integrated power systems and main producers of energy accessories and pumps such as Chekhovsky works of power machine building - the OJSC "CWPM", the OJSC "Penztyazhphromarmature", OJSC "Alexinsky works of heavy industrial accessories", "Nasosenergomash" (Sumy city), etc.

The customers of seals of new generation and domestic production are currently the hundreds of TPPs and heating systems in 42 power systems. Accordingly to statistics, the share of such seals in high-pressure accessories at TPPs and heating systems makes 80…90 %, while in the low-pressure accessories it is 30…40 %.

Experience, accumulated in 90-ties at thermal power plants of Mosenergo, Chelyabenergo, Lenenergo as well as at some nuclear power plants — Leningradskaya, Ingalinskaya, Kurskaya, Smolenskaya — shows the high efficiency of applying the flexible material "Graphlex' instead of asbestos-containing packing and paronite used before.

Analysis of statistics and data of the controlled operation of seals "Graphlex" showed the increasing service life of seal, depending on the type of accessories (stop or control valves) from 2 to 6 times in comparison with traditionally used asbestos pressing. The increase in service life reduces proportionally the general demand for sealing materials. In addition, for sealing the accessories gland, it is necessary to have "Graphlex" material 1.5…2 times less than the asbestos, because the reliable hermetic sealing is provided by the less number of sealing rings. There is finally the general reduction of the consumed sealing material 3…8 times for the period between capital repairs. The raise of seal service life also impacts the general man-hour for the equipment repair. Reduction of corrosion and erosion in details of the gland chamber decreases the expenses for parts replacement.

The statistical results of using the seals of graphite foil "Graphlex" are presented in table 7.7 in comparison with asbestos seals.

Comparison of total expenses for repairing high-pressure accessories of power units with capacity of 80 и 250 MW in case of using traditional for electric power industry asbestos packing of types AG-50, AG-1 and new packing from material "Graphlex" in overhaul period is presented in table 7.8 (data for CHPP-26 of the OJSC "Mosenergo").

As one can see from the table, expenses for repairs are several times less in case of application of the highly reliable gland seals in spite of their much higher cost.

Total expenditures, taking into account the losses in case of emergency stops, are several times decreased. It should be noted as well the considerable reduction of consumed fuel-energy resources: reduction of steam and condensate losses, saving of electric energy.

Table 7.7. **Comparative operational characteristics**

Equipment	Service life of seal, months	
	Asbestos	"Graphlex"
Stop valves:		
Valves	6...12	24...48
Steam valves	4...6	24...48
Water valves	to 12	to 48
Control valve:		
regulating valves	5...8	12...24
Injection valves	3...4	12

Table 7.8. **Expenses for accessory repair using asbestos packing and packing from material "Graphlex"**

Expenses item	General expenses, %	
	"Graphlex"	AG-50
Material expenses	0.5	1
Expenditure for replacement of accessory details	5	22
Man-hour for gland repack	5	21
Expenses for emergency stop because of problems in seal	-	56
Totally	10.5	100