on the prospects of further development of this important form of equipment. Taking into consideration the specifics of high-pressure apparatus, for which the problem of providing strength and reliability is of first importance, a number of the articles are devoted to investigation of the stress state and strength calculations of apparatus and its elements. The collection also includes articles devoted to some specific questions of the technology of producing high-pressure apparatus.

By publishing this subject collection the editorial board does not consider the question closed but plans to continue publication of articles devoted to individual aspects of the development and introduction of apparatus, piping, and other forms of equipment designed for operation under high-pressure conditions.

PRESENT STATE AND PROSPECTS FOR IMPROVEMENT IN HIGH-PRESSURE APPARATUS AND PIPELINES

V. G. Usenko

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The Twenty-Fifth Congress of the Communist Party of the Soviet Union (CPSU) and also the following plenum session of the Central Committee of the CPSU have marked out a program for the further increase in economic power of this country during the current five-year plan. Special attention is being paid to the development of branches of industry which are called upon to provide all spheres of the national economy with contemporary machines and equipment. Much importance is assigned to the future development of agriculture, in particular to providing it with mineral fertilizers to the maximum extent where processes for making these take place at elevated pressures and temperatures.

In the chemical, petrochemical, petroleum refining, and a number of other branches of industry, processes are being used more and more which are connected with the use of equipment which operates at high pressures and temperatures. The processes of ammonia synthesis, synthesis of methanol, urea, butyl alcohols, petroleum hydrocracking, etc. which have been mastered by domestic industry are performed with the aid of equipment which operates at pressures up to 320 kgf/cm². Such apparatus is manufactured by the machinery-building plants of the country. However, technical progress is putting more and more new problems to machine-builders.

Assemblies are appearing which exceed the present ones in unit capacity by a factor of 5-10. Processes are being mastered which are connected with the use of equipment which operates at pressures up to 3000 kgf/cm², and it is proposed to carry out the manufacture of polyethylene at a pressure of 5000-7000 kgf/cm². Solution of these complex engineering problems is possible only as a result of developing new large-size equipment constructions of large unit capacity and fundamentally new efficient technology for making it.

At present a strong technical base has been created for the manufacture of high-pressure equipment and pipelines which basically assures the needs of the chemical, petrochemical, energy, and other branches of industry. Finally, there is much experience in devising, fabricating, and operating this equipment, which makes it possible to make a new step in increasing its efficiency and quality. Unique high-pressure apparatus of large size is manufactured by the 50th-Anniversary-of-the-USSR "Uralkhimmash" plant, the Zhdanov Izhorskii plant, the Petrov Volgograd petroleum engineering plant, and others. Today the 50th-Anniversary-of-the-USSR "Uralkhimmash" plant has the technical ability to make such apparatus in diameters up to 3000 mm and up to 500 tons in weight. This plant supplies high-pressure equipment combined with tubing assemblies to plants of the chemical and petrochemical industries.

The Irkutsk NIKhimmash has been concerned with the development of high-pressure equipment for more than a quarter of a century.

Over the course of a long time, complex engineering problems of strength and reliability of the equipment developed have been solved in the institute; progressive technology has been developed, plus new constructional materials; and contemporary constructions have been sought. Many of these problems have been solved in creative collaboration with various plants and organizations. As a result of the scientific studies and experimental-constructional work which have been carried out, a large number of fundamentally new specimens of high-pressure chemical equipment have been devised and introduced.

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In the first 10-yr period such big scientific-technical problems were solved as devising the manufacture of apparatus and parts of high-pressure pipelines on a fundamentally new basis. As a result of many years of creative collaboration of the Irkutsk NIIkhimmash, the 50th-Anniversary-of-the-USSR "Uralkhimmash" plant, the E. O. Paton Electrical Welding Institute of the Academy of Sciences of the Ukrainian SSR, and the Minchermet plants, a fundamentally new construction of multilayer rolled high-pressure vessels was devised and technology for making them was developed. The introduction of a line for the serial manufacture of such vessels in the 50th-Anniversary-of-the-USSR "Uralkhimmash" plant was an important contribution to the development of domestic apparatus manufacture. This country was the first in the world to develop the possibility of making high-pressure apparatus with a multilayer rolled wall having practically any size.

With the development of the new high-pressure apparatus construction, the volume of metal in them was reduced by a factor of 1.5; and the amount of labor in making them, by a factor of 10. Such equipment has been operating for more than 8 years already in the chemical plants of this country. The collectives which developed it were honored with the state prize of the USSR in 1976.

The Irkutsk NIIkhimmash, the 50th-Anniversary-of-the-USSR "Uralkhimmash" plant, the E. O. Paton Electrical Welding Institute of the Academy of Sciences of the Ukrainian SSR, the GIAP, the TsKBA, plants of the Minchermet, the Mintyazhmash, and others have conducted much work on mastering the manufacture and on the introduction of progressive constructions of high-pressure vessels and apparatus, pipelines and equipment, on the investigation and use of new high-strength steels, on improving fabrication technology, and raising the quality and reliability of the equipment produced. A set of normative documents on the design, strength calculation, technical control, operation, and repair of apparatus, pipelines, and high-pressure equipment has been developed, and also on the selection of materials for them.

Technical progress places more and more new problems in front of machine manufacturers. A need has appeared for devising assemblies which exceed those now operating in their unit capacity by a factor of 4-8. Processes which take place at ultrahigh pressures and temperatures are being used increasingly widely. New processes are being mastered, which are associated with the use of equipment that operates at pressures up to 3000 kgf/cm² and temperatures up to 600°C. The national economy presents the very important problem of devising highly efficient, manufacturing, and high-quality high-pressure equipment to supply the rising needs of the chemical, petrochemical, and other branches of industry.

Apparatus-making development is taking place in the direction of further improvement in multilayer constructions of high-pressure vessels as the most progressive of those mastered at present. The main attention in increasing the reliability of vessels and the internal devices in apparatus is being directed to development so that they will not require opening, inspection, or repair during the process of operation. This is especially important for assemblies of high unit capacity, where each day and even each hour of down time is associated with huge losses in production.

An important expansion in the manufacture of high-pressure vessels requires carrying out work on replacing elements (flanges, bottoms, or shells with side inlets) from scarce heavy forgings with multilayer elements; and on improving and raising the productivity of technological fabrication processes, including welding and technical control.

Further reduction in metal volume and increase in the quality of high-pressure equipment are impossible without devising and mastering the output of high-strength, readily weldable rolled steels with a trimmed edge and a minimum of sickle-shapedness or wedge-shapedness. An expansion in the assortment of sheet steels for bottoms and other elements of high-pressure apparatus is necessary.

In view of all this, the Irkutsk NIIkhimmash, in close collaboration with other organizations, is conducting work on the improvement of the apparatus developed and is preparing for commercial fabrication new, still more economical apparatus, which is more reliable in operation.

Thus, jointly with the "Uralkhimmash" plant, a construction of spirally rolled vessels of increased reliability has been developed and investigated, which ensures the possibility of using more contemporary technological processes and a reduction in labor in manufacture of more than twofold.

Jointly with the Severodonets Branch of the NIIkhimmash and the "Uralkhimmash" a fundamentally new rolled-reinforced high-pressure vessel construction is being developed which ensures a further increase in productivity in fabrication, an improvement in quality, and an increase in the reliability of the apparatus.

Scouting work is being conducted on devising vessels of diameter over 5000 mm and technology for making them or for prefabrication at the site of mounting. This work has much importance for further increasing the outputs of the chemical, petrochemical, and other manufacturing operations.