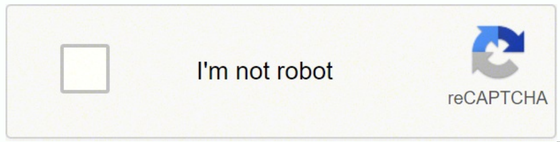

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How to improve gas turbine efficiency

Photo Courtesy: Moyo Studio/iStock You may have felt discomfort and swelling in your stomach at some point in your life. This is called bloating —- and most people experience it as well. Bloating is when your stomach feels swollen after a meal that can be caused by a lot of gas or disruptions in muscle movement. Bloating can make your stomach look larger, and it often causes pain and discomfort. Read on to discover why you feel bloated and how to prevent and reduce your bloating quickly. What Are the Causes of Bloating? Photo Courtesy: AndreyPopov/iStock The best way to get rid of bloating and prevent it the next time is to know the cause. Bloating can be triggered by a wide variety of reasons, and some common causes of bloating are: Food choices: Too much saltToo much sugarNot enough fiber Food allergiesFizzy or carbonated drinksRaw veggiesSpicy foodsFatty foodsAcidic drinks Hormonal changes: Premenstrual syndromeStressPregnancy Medical conditions: Lactose intoleranceFructose intoleranceIrritable bowel syndrome Celiac diseaseAcute gastrointestinal infection Blockage Your doctor will be able to help you determine if you have any medical conditions that could cause bloating. For example, lactose intolerance is common and may lead to bloating. Lifestyle choices: Tips to Reduce or Prevent Gas and Bloating. You can do easy things to help you feel better while bloated. If bloating still occurs, you can follow our 5 easy tips to reduce the bloating. Move If you feel bloated, try going for a walk. Regular physical activity gets your bowel moving, which helps release the excess gas which might cause bloating. Exercise can help reduce your bloating, and it can also help prevent bloating. If you don't like walking, you can try other forms of exercise like yoga or pilates. Both stretch the muscles in the abdomen — this helps to release the gases from your intestine and reduce bloating. Try a bloat-reducing abdominal massage A massage can help reduce the pain caused by bloating. During the massage, it's necessary to follow the way the bowel takes through the abdomen. Begin with both hands just above your right hip and divide the stomach into 4 parts. Starting in the lower right side. Move your hands in a circular motion, and go upwards into the upper right side. Next, move straight across the upper belly to the left upper side, and increase the pressure as you go down to the left lower side. You can repeat this as often as you like. Please be gentle with yourself and contact your doctor if you have a lot of pain. Reduce stress If you feel bloated, try an activity that helps you to relax and help you feel less stressed, like:Take a warm soaking bathRelax while reading a bookGo for a walkTry meditation and mindfulness techniquesTry yoga Try to change eating habits that cause bloating There are many things you can try to reduce bloating — but one thing you might need to change is your eating habits. Here are some tips: Eat more fiber. Eating fiber can help prevent bloating, but most people don't eat enough fiber. Replace fizzy/carbonated drinks. Consider replacing your sparkling waters and fizzy drinks with plain water. You can add a tiny bit of juice if you don't like plain water, but don't drink juices all the time. Stop chewing gum. You can avoid chewing gum which might help reduce bloating. If you chew gum, you might ingest some air and swallow it while chewing, which leads to bloating. Eat at regular times. If you eat at regular times throughout the day — eating several small meals— it can help your digestive system. Eat slower. When you eat too fast, you're more likely to ingest excess air, which can cause bloating. Slow down while you eat and close your mouth while chewing. If you want to track your eating habits, try a food diary to determine which ones may cause your bloating. In your food diary, you can write down what you are eating and see the next day if you feel bloated. You can also talk to your doctor about special diets that help with bloating. Check with your doctor Photo Courtesy: milan2099/iStock Lastly, you should see your doctor if bloating becomes a chronic problem. If bloating causes increasing pain and the bloating that seriously affects your quality of life, see your doctor as soon as possible. Resource Links MORE FROM SYMPTOMFIND.COM Whether you're setting up a welding business or outfitting your home garage, it's important to know how to buy a gas cylinder. Check out this simple guide to purchasing gas cylinders, and get yourself set to take on that project.Where to Find Gas CylindersAn empty gas cylinder is easy to purchase online or at your local home improvement store. Gas cylinders designed to hold oxygen, argon gas, propane and nitrogen are often sold at hardware stores, farm stores and even camping supply stores. You might also find gas cylinders to fit your needs on auction websites, through local classified advertising and via department stores that offer camping equipment along with outdoor supplies.Purchasing From a Gas Supply CompanyMany people who purchase gas cylinders (especially those used for projects that include welding) choose to buy their gas cylinders from gas supply companies. These companies offer exchange programs for gas cylinders that hold oxygen, nitrogen, acetylene and even propane. Your initial purchase is the most expensive, since you are buying the gas along with the gas cylinder. Once you've bought a cylinder, they are exchanged rather than filled.Storing Gas CylindersOSHA gas cylinder storage rules offer important safety advice for anyone who buys a gas cylinder. Many gas cylinders are designed to be used only in an upright position, making it tough to find space for storing large cylinders. There are also rules that apply to the transport of gas cylinders, including the use of special valve protection caps that ensure that the gas does not escape from the cylinder if you are involved in an accident. OSHA gas cylinder storage rules are found online, as noted on USA Safety.Traveling With Gas CylindersWhen you're using your truck or trailer to carry your gas cylinders to a job, the cylinders must be secured in an upright position using a chain, or placed in a special container that is designed to keep them stable. OSHA requires oxygen cylinders to be stored separately from fuel-gas cylinders, and all gas cylinders must be kept in a vented area to prevent gases from building up and causing an explosion, per USA Safety.Average Gas Cylinder CostThere are lots of gas cylinder sizes and styles, making the cost tough to pinpoint. As of the time of writing, a 40-cubic foot acetylene gas cylinder that is empty averages about $85, while an empty 10-pound carbon dioxide cylinder is about $110. You might purchase nitrogen gas cylinders in high-pressure styles for about $190. Many welding or gas companies offer lower prices for tank exchanges or for empty tanks, per Matheson. MORE FROM QUESTIONSANSWERED.NET ...but your activity and behavior on this site made us think that you are a bot. Note: A number of things could be going on here. If you are attempting to access this site using an anonymous Private/Proxy network, please disable that and try accessing site again. Due to previously detected malicious behavior which originated from the network you're using, please request unblock to site. Volume 28, January 2016, Pages 95-105 rights and contentCompressor inlet air cooling systemView full text Although the performance of the gas turbine is not especially attractive compared with the efficiencies possible in Diesel and Petrol engine power plants, a simple gas turbine has advantages in weight, size and vibration compared to the engine and in size and cost compared to small steam plant. It is also superior to both in quantity of water used, for the simple gas turbine plant uses almost no cooling water. Even if the components used in the gas turbine power plants are improved in design, the efficiency and the specific output of the simple gas turbine cycle are quite low. The efficiency handicap is surmountable, at the expense of adding complexity to the gas turbine plant. The principle refinements which accomplish this are: (a) Regeneration (b) Intercooling and (c) Reheating. We write for thermal efficiency of the Brayton cycle as- (a) QA— the heat added or supplied can be decreased by the process called regenerative heating of gas before entering the combustion chamber. (b) Compressor work Wc can be decreased when multistage compressors with intercooling are used. (c) Turbine work-output can be increased by using a multistage turbine with reheating of the gas in between the two stages. Thus the modifications in the simple gas turbine cycle required for improving the performance of the cycle are: Methods to Improve the Efficiency of Gas Turbine Methods # 1. Regeneration: We observe that the temperature of the turbine exhaust at (4), Fig 34.8, is higher than the temperature at the end of compression at 2, and, therefore, we may think of applying Ericsson's notion of regeneration. In this event, the exhaust at 4 gives up heat to the air at 2. This transfer of heat is called Regenerative heating and the heat exchanger used for this is called Regenerator. This results in cooling of final exhaust gases and thus a reduction in heat rejection takes place. Theoretically, if the heat exchanger were large enough and flow were slow enough, the air from the compressor could be heated reversibly to temperature 4 at state b, while the exhaust cools to temperature 2 at state a. Some of the formerly discharged heat h4 – ha is exchanged within the system and the heat to the sink is now only ha – h1. Moreover, it is necessary to add only the heat equal to h3 – hb instead of h3 – h2 as before. Consequently less fuel is needed and this additional piece of equipment should materially increase the efficiency of the ideal cycle. From the figure we find the thermal efficiency for a constant mass of 1 kg as- With a fixed initial temperature T1 the above equation shows that with a regenerator, the thermal efficiency increase as T3, increases and the thermal efficiency decreases as the pressure ratio increases. Without the regenerator, the cycle efficiency increases as the pressure ratio increases. Effectness of Regenerator: Figure 34.10 is the T-S diagram for imperfect regeneration with fluid friction in turbine. 1-2 Isentropic compression of air in compressor. 1-2′ Actual compression. 3-4 Isentropic expansion of gases in turbine. 3-4′ Actual expansion of gases in turbine. If regeneration is perfect then d is the state of air before combustion chamber c is the state of gases before the gases are exhausted and in this case heat given by gases from turbine is equal to the heat given by gases from turbine is equal to the heat gained by air in the regenerator. But the actual state of air will be d' because the regenerator will not be perfect. Consequently the regenerator will not be 100 % efficient. The performance of the regenerator is given by the Effectiveness of the regenerator. It is defined as- Methods # 2. Intercooling: Net work of the gas turbine cycle can be increased either by reducing the compressor work or increasing the turbine work. For decreasing the compressor work, advantage is taken of the nature of the constant pressure curves of h-s and T-S diagrams. The vertical distance between any two constant pressure lines goes on decreasing to the left and goes on increasing to the right. If the compression is achieved in two or more stages, the air delivered by the 1st stage of the compressor, is cooled, on its way to the next stage. This cooling of air in between the two stages is called intercooling. When the air is cooled to the temperature of air entering any stage, intercooling is called perfect intercooling. 1-2 Isentropic compression in first stage 2- 3 Intercooling between the stages 3-4 Isentropic compression in the second stage 1-5 Isentropic compression without intercooling Vertical distance between 3-4 is less than the vertical distance 2-5 and therefore, [(1-2) + (3-4)] < (1-5) ∴ The compression work is reduced while the turbine work remains same when other data remains same. ∴ Network = Wt – Wci = Constant – reduces Wc > Wt – Wc Where Wc = h5 – h1 Wci = Compression work with intercooling. When the intercooling is perfect and when the intermediate pressure is the geometric mean (P2 = √p1 x p3) then the compression work is minimum. Usually water-cooled surface coolers are employed. Low and high pressure stages must necessarily separately encased. Figure 34.12 shows intercooling and fluid friction during compression. The diagram is self-explanatory the same working substance flows through the different components of the plant again and again, receiving heat and rejecting heat at the approximate events in the cycle. If the entire flow comes from the atmosphere and is returned to the atmosphere, the turbine is said to work on the Open Cycle. The basic difference between open and closed cycle gas of turbines is in the method of heating the air after compression. In case of an open cycle gas turbine, the fuel is burned in the air itself to increase its temperature i.e., fuel is mixing with air and then the products of combustion are passed on to the atmosphere through turbine. For the next cycle, a fresh supply of air is taken in the compressor and the processes are repeated. On the other hand, in a closed cycle gas turbine, the same air or working substance is circulated over and over again. The working substance is heated in a heat exchanger where a separate hot gas is obtained by burning the fuel in the supply of additional air in a combustion chamber. The heat exchanger is of the shell and tube type so that working substance does not come into contact with the products of combustion. Most of the gas turbines in use are open cycle plants. But the recent developments made the closed-cycle plants work producing more than 1500 kW and having gas turbine inlet gas temperature of 800°C and having a thermal efficiency of the order of 30 %. At state 1, cold gas enters a compressor, where shaft work is to be done on the compressor to increase the pressure and temperature. The gas leaves the compressor at the state 2. This gas enters the heater (heat exchanger) where heat is supplied at constant pressure. The temperature of the gas increases and the gas leaves the heater at state 3. This gas from the heater enters the gas turbine where it is expanded to the lower pressure so that the temperature is reduced, shaft work is produced. Part of this shaft work is utilized to run the compressor and the rest is supplied to the load or the useful power or net-power. Methods # 3. Reheating and Reheat Cycle: Another variation in the simple Brayton cycle is the use of two turbines instead of one, in which case, one turbine is used to drive the compressor and the other produces the network output. The shafts of the turbines may collinear or as shown in Fig. 34.14. In between these two turbine we may or may not arrange to bum more fuel by installing another combustor as shown. Reheating is the increase of temperature of partially expanded gas by burning more fuel, in a device called Reheater. Figure 34.14 shows reheating and regeneration. Methods # 4. Gas Turbine (Brayton Cycle) with all Intercooling, Reheating and Regeneration: All the modifications to the simple cycle may be applied separately or together. They are capable of raising the plant efficiency to over 30%, thereby erasing any advantage of fuel efficiency possessed by Diesel or condensing steam plant. A schematic diagram of modified Brayton cycle incorporating intercooling, reheating and regeneration is shown in Fig. 34.15. Methods # 5. Effect of Modifications on the Performance of Brayton Cycle-Gas Turbine: Various graphs showing the effect of intercooling, reheating and regeneration on the cycle efficiency are given in Fig. 34.17. These graphs give the nature of the curves only. A—Simple cycle. B—Simple cycle with regeneration. C—Simple cycle with intercooling and regeneration. D—Simple Open cycle with regenerator, re-heater and inter-cooling. Combine effect of intercooling, reheating and regeneration on gas turbine cycle on thermal efficiency and specific output for different maximum temperatures are shown in Fig. 34.18 (a) and (b). Methods # 6. Water Injection: This is one of the methods of improving the performance of the gas turbine is to inject water into the working air at the entrance to the compressor. This way the compressed air is cooled by absorbing, from air, the latent heat of vaporisation of water. By injecting of water, the total mass flow of the working medium is increased by the mass of the injected water and hence the power output of the cycle is increased, the work ratio is also increased in addition to the lowering of the air rate. Water injection system is commonly used as a power book for take off and emergencies on the jet propelled air-craft. It is possible for marine or land based gas turbines to use water injection for long duration or continuous water injection. The water to be injected should be pure otherwise it may cause corrosion or deposits on the blades.

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