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The Manufacture of Rum

Part IV

Curing and Maturing the Product . . Dilution of the Distillate, Removal of Odor, Aging Methods

*By Rafael Arroyo, Ch.S., S.E.**

To resume the salient points of this discussion on rum distillation we will state that: (1) Rum distillation is a process of selective and rectifying extraction. (2) The process of fermentation and the post-fermentation treatment of the fermented mash bear great influence on that of distillation, as regards quality of product. (3) Stills, whether of the continuous or discontinuous type, should have ample capacity so that the distillation will never have to be rushed. (4) The temperatures of the cooling water entering and leaving the condenser should be carefully recorded and a difference of not less than 30°C. should be kept between inlet and outlet water, provided the temperature of the inlet water is not below 30°C. A greater difference must be maintained when this temperature is below 30°C. (5) The distillation method to be adopted requires special study in each particular case; but in a general way, when quality of finished product is the main and most important factor, discontinuous or batch stills should be used. (6) The economic advantages of the continuous system of distillation are apparent and undeniable. For large, bulk production, the continuous still may become necessary; but even in this case the opinion of the writer is that a combination of both systems should then be used. (7) Foulness of odor in the raw distillate is unnecessary, undesirable, and entirely eliminable by methods herein outlined. (8) It is important to distill rum at the lowest possible proof compatible with a good quality of raw distillate.

Having thus obtained our rum in the raw state it becomes necessary to develop to the utmost the inherent characteristics of a good product. This is secured by the process known as curing or maturing. Here we wish to state emphatically that by this process we do not mean converting a bad product into a good, wholesome one. Not by any means. The rum that is bad in its raw state will continue to remain so, no matter what is done with it, or to it, unless we entirely change and destroy its inherent characteristics as rum, and convert it by many and dubious processes into that we choose to call rum. Proper rum curing is not a process to change or transform, but to develop and further enhance the latent qualities existing in the right kind of raw distillate. Of course, a bad raw distillate or raw rum may be made to improve, but it will never be converted into a first class beverage through the curing process, whether the natural or slow or the artificial or rapid curing be employed.

Before starting the curing process, certain preliminary treatment of the raw distillate is almost always necessary, especially under present practices of rum manufacture. With a high class distillate this treatment consists only of diluting to a certain proof before storing in oak barrels in the case of natural curing, or before proceeding with accelerated aging in the case of rapid curing. With inferior quality raw distillates (which are the great majority) further treatment more than dilution becomes necessary with either natural or artificial curing. This consists in most cases in elimination of foulness of odor, ("hogo," "tufo"), from the raw distillate. There are two principal ways of accomplishing this purpose, one of them essentially chemical in nature, the other essentially physical, while intervening between these two are many others, using features of each of the principal two methods mentioned. The chemical treatments in the hands of the profane may constitute a source of great danger to the industry itself and to public health as well. To illustrate this point I wish to present comparative analyses of two rums. No. 1 represents the diluted raw distillate before any further treatment; while No. 2 represents the same raw distillate after it had passed through chemical treatment with the object of removing foulness of odor or "hogo".

A glance at the comparative analytical results will show that: (1) Sam-

Analytical Results

	Sample No. 1	Sample No. 2
Sp. Gr. at 20/4°C.	0.93056	0.94331
Alcohol by volume %	49.80	42.87
Grs. alcohol in 100 ml.	39.31	35.86
pH value	4.80	5.20
T. acidity, mgs. per 100 ml. ab. alcohol	17.10	182.7
Aldehydes, mgs. per 100 ml. ab. alcohol	53.60	Traces
Esters, mgs. per 100 ml. ab. alcohol	56.60	2.1
Extraneous impurities	None	Manganese, Potassium, Ammonium, Iron, Sulphates, Chlorides
Organoleptic tests	Foul odor Bad taste	Bad taste No odor

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ple No. 1, that had received no treatment, was a sample of a poorly fermented, uncarefully distilled rum; hence its bad taste and foulness of odor. Nevertheless it was a rum. (2) Sample No. 2, the same originally as No. 1, received a certain chemical treatment aimed at obliteration of bad odor and taste. But what has really happened? The writer, who tested these two samples, admits that the "treatment" succeeded in eliminating foul odor; but at the same time no new good odor was developed; the bad taste was changed in character, but remained, worse than originally. Besides, the poor sample of rum was transformed into a wholly different, infernal beverage, that was no longer rum, or alcohol, or anything to which a specific name could be applied. Notice that during the treatment almost 7.0% alcohol by volume was lost; besides practically complete destruction of esters and aldehydes originally present. These destructions of valuable aromatic constituents were supplemented by an enormous increase in total acidity and by the incorporation into the rum of extraneous impurities, such as sulphates, chlorides, manganese, iron, potassium. Only qualitative tests were made for the presence of these extraneous, newly incorporated impurities, but the reactions that occurred showed that appreciable quantities existed in each case, especially as to sulphates, chlorides, ammonium, and potassium. The inference of the writer was that potassium, permanganate and sulphuric acid were used to destroy the bad odor through violent oxidation. Then it was found that the liquid turned very acrid, coarse, and with a chemical taste, and it was thought to alleviate this condition by the addition of chloride of ammonium and ammonia water. The final results, as may be seen, were disastrous. We are sorry that time and space do not allow the presentation of other cases.

We shall proceed now to discuss the practice that we consider best and least harmful to the prestige of the vigorous, young industry and to the health of the consuming public. This consists of first diluting the raw rum to between 100 and 110 proof, the final proof to be determined by the length of time intended for aging and size of container to be used, in case slow, natural aging is to be used for obtaining maturity; or according to the nature of the subsequent quick aging process to be practiced. We believe, though, that the range 100-110 proof will take care of most cases. When a poor distillate is thus diluted, the foulness of odor becomes much more accentuated and noticeable. At this point I beg to be excused for a digression in behalf of the average continental American citizen who may read these pages. The American public is well aware of the fact that whiskey, as first produced by any of the well known processes, is a liquid very raw, very unpleasant to the taste, and very disagreeable in odor. The public also knows that it takes many a year of natural aging to change this liquid into a potable product. This is not the case with rum. Rum, properly fermented and distilled, possesses agreeable taste and fine bouquet as such. In some instances it could be used outright. This is the reason why I make reference to the natural taste and bouquet of a raw distillate. Moreover, rum will age or mature to its optimum condition in but a fraction of the time necessary in the case of whiskey. This we have definitely proved in our work, and the fact has been corroborated by European rum experts. When present, this foul odor may be partially or completely removed (according to its origin and nature) through the application of activated vegetable deodorizing chars. The amounts of the carbon to use will be determined in each particular case. This is a case of foulness of taste and odor removed through absorption, and the process is to be preferred in all respects to the destructive and polluting drastic chemical treatments. After the end has been accomplished, the carbon is removed by filtration.

What has happened to the raw distillate during the diluting process, or the diluting and carbon treatment processes? First of all, the ideal raw distillate would be one needing no dilution or treatment of any kind before proceeding with curing, either slow or natural, or accelerated or artificial. Further, these conditions are attainable through proper yeast selection, fermentation methods, and post-fermentation treatment of the fermented mash, followed by carefully controlled distillation methods. But present technic has not come to this yet. Hence, we must treat of the important changes occurring during the processes mentioned. Let us take first the effects of dilution upon the raw distillate. When a freshly distilled rum is diluted, its chemical composition as well as its physical characteristics are affected. The action of the diluent is felt to a greater or lesser extent, in accordance with: (1) original proof at which distillation took place; (2) chemical composition of the raw rum; (3) nature of diluent, and manner of applying it. The deleterious action of the diluent is twofold: chemical and physical. The first consists in a dissociation of part of the ester content through the hydrolytic action of the added diluent acting in an acid medium; the second operates by salting out or separating certain essential oils through shock and by the lowering effect on the alcoholic concentration of the raw rum through the addition of the diluent. Among these oils we have some of the most valuable natural constituents of a good rum.

When the raw rum has been distilled at a very high proof, say 170-175°, a very large amount of diluent must be added to bring down the proof to say 100-110°. Now the more diluent added, the stronger will become its hydrolytic effect on the esters of the raw distillate, and the stronger will the tendency become towards separation of the essential oils. Hence, the caution previously given to distill at the lowest possible proof compatible with high

quality of distillate. When we consider the original chemical composition of the raw rum in its relation to the process of dilution, we will readily see that the higher the total acidity of the raw distillate, the faster and more intense will become the hydrolyzing effect of the diluent on the ester content. Also, the higher the original ester content, the higher will be the amount of hydrolysis taking place. This will also hold true as to the content of essential oils in the raw rum.

The nature of, and manner of adding the diluent will also become a factor of importance during the process of diluting the raw rum. There are at least six classes of diluents commonly used (at least in the tropics) for this process: (1) ordinary tap water from the city mains; (2) well water; (3) rain water; (4) distilled water; (5) chemically treated water; (6) alcoholic solutions in distilled or rain water, previously cured by either natural or artificial aging. This last mentioned diluent is the most beneficial and best recommended, but is the one less used on account of the trouble of preparing and storing under suitable conditions large quantities of these weakly alcoholic solutions. Good practice in rum manufacture should restrain the number of diluents to but three of the six mentioned above, and these should include: (1) distilled water (aerated), (2) rain water, and (3) alcoholic solutions. When these three diluents are used we still have the inconveniences of ester hydrolysis and essential oil separation, but in a less degree than when the other above mentioned diluents are used. Of the two plain water diluents, rain water is to be preferred, as it contains plenty of air and lacks the flatness of taste peculiar to distilled water. Thoroughly aerated distilled water will also do. Diluting with aged mixtures of alcohol and water at about 20% alcohol by volume will be the best method to follow; but as explained before, this method also has its shortcomings, especially for the large producer.

Now, whatever the nature of the diluent in use, the manner in which it is applied to the raw rum will have considerable influence in the extent of ester hydrolysis, especially as to the extent of separation of valuable essential oils. Cold diluent, suddenly added in bulk, or added in a very short period of time, will prove the most harmful. The opposite condition of applying the diluent, i.e. slightly warm, slowly and in an atomized form, will prove the least harmful. Once the raw rum has been conveniently diluted, if foulness of odor is observed, it must be removed in some way, and we have stated that treatment with activated deodorizing chars is the best method to use for this purpose. The amount of char to use is a very variable quantity, depending on the nature and extent of the foulness to be removed. We have found that the expense involved in the use of activated char will not greatly increase the cost of production. Ordinarily an expense of from 0.2 to 0.5 cents per gallon of treated rum will suffice. There are, however, two risks in this treatment: (1) The carbon will absorb some of the aromatic constituents of the rum together with the ill-smelling ones; (2) if a thorough and very efficient filtration is not effected after the carbon treatment, some of the finest particles of carbon will pass through with the filtering liquid, and will form a deposit later on when the rum is bottled, especially when the accelerated, or rapid curing method is employed.

Having prepared our raw distillate for the curing process, the next step is to decide on the method by which this is to be realized. There are two general systems of curing or maturing employed: slow or natural curing, and accelerated or artificial curing. The first offers little variation in technic, while the latter is very variable; as many methods and combinations of two or more methods exist as there are rectifiers engaged in the business of rum making. We shall treat each system, in the order mentioned. The slow curing method is that in which maturing is sought through the action of time, air, and a good oak barrel, with very little added help. In this case, the development of the desired properties commonly sought in a properly matured product, such as body, good taste, mellowness, and delicious aroma, will depend on the following factors: (1) inherent characteristics of the raw rum; (2) quality of the barrels in which the aging is to take place; (3) size of the barrels; (4) pre-treatment to which these barrels were submitted before filling them with raw rum; (5) kind of barrel, charred or plain; (6) temperature and relative humidity prevalent in the storage room; (7) length of the aging period. In the next section of this paper we shall consider, to the extent allowable in a necessarily short article, each of the above mentioned factors.

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Beet Industry Advisory Committee

A Beet Sugar Processing Industry Advisory Committee has been formed to work with the Sugar Section of the War Production Board. A. E. Bowman, chief of the Sugar Section, is the government presiding officer, and the committee members are H. A. Benning, Amalgamated Sugar Company, Ogden, Utah; W. N. Wilds, American Crystal Sugar Company, Denver, Colorado; H. W. McMillen, Central Sugar Company, Decatur, Indiana; J. Stewart, Garden City Company, Garden City, Kansas; Frank A. Kemp, Great Western Sugar Company, Denver; Wiley Blair, Jr., Holly Sugar Corporation, Colorado Springs; A. W. Beebe, Lake Shore Sugar Company, Detroit, Michigan; R. E. Lies, Menominee Sugar Company, Green Bay, Wisconsin; W. W. Patterson, Michigan Sugar Company, Saginaw, Michigan; A. A. Schupp, Paulding Sugar Company, Paulding, Ohio; Frank J. Belcher, Jr., Spreckels Sugar Company, San Francisco; J. W. Timpson, Utah-Idaho Sugar Company, Salt Lake City.