

F. No. 4/1/2018-(BP&E)(Part)
Government of India
Ministry of Consumer Affairs, Food, and Public Distribution
(Department of Food and Public Distribution)
Directorate of Sugar & Vegetable Oils

Krishi Bhawan, New Delhi
Dated: 21.12.2023

OFFICE MEMORANDUM

Subject:- Mechanism to assess production of ethanol from Sugar and grain feedstock: Guidelines regarding.

The undersigned is directed to refer to the Committee constituted under Chairmanship of Director, National Sugar Institute, Kanpur to study the issues concerning to production of ethanol from B-Hy, C-Hy molasses, sugarcane juice, sugar & sugar syrup, food- grains such as maize, broken rice, surplus rice sourced from FCI etc. and mechanism to identify the quantity of ethanol produced from each of these feed stocks.

2. The Committee has suggested a detailed mechanism for production of ethanol from B-Hy, C-Hy molasses, sugarcane juice, sugar & sugar syrup, food- grains such as maize, broken rice, FCI rice etc. and mechanism to identify the quantity of ethanol produced from each of these feed stocks.

3. Based on the recommendation of the Committee, this Department has formulated a new set of guidelines in supersession of earlier guidelines issued vide OM No. 4/1/2018-(BP&E)(Part) dated 11.11.2022 and amended dated 29.03.2023, which is enclosed herewith for strict compliance by sugar mills and concerned distilleries.

4. These guidelines shall be applicable for ESY 2023-24 and beyond, till further orders.

Enclosure: as above



(Sangeet)
Director (S&VO)
#011-23383760

To,

1. Principal Secretaries in charge of Sugar of concerned States
2. Principal Secretaries of Excise Departments of concerned States
3. Cane/Excise Commissioners of concerned States

4. Ministry of Petroleum & Natural Gas
5. All sugar mills with attached distilleries/standalone ethanol distilleries
6. ISMA with a request to circulate the guidelines among its member sugar mills/distilleries.
7. NFCSF with a request to circulate the guidelines among its member sugar mills/distilleries.
8. AIDA with a request to circulate the guidelines among its member distilleries.

Guidelines for sugar mills /distilleries regarding the production of ethanol by from B-Hy, C-Hy molasses, sugarcane juice, sugar & sugar syrup, food-grains such as maize, broken rice, surplus rice sourced from FCI etc. and mechanism to identify the quantity of ethanol produced from these routes (Reference DFPD OM No. 4/1/2018-(BP&E)(Part) dated 11.11.2022 and amended dated 29.03.2023)

These guidelines will supersede earlier guidelines issued vide OM No. 4/1/2018-(BP&E)(Part-I) dated 11.11.2022 and amended dated 29.03.2023 which were revisited, particularly, with reference to parameters to be considered for determining quality of B-Hy molasses and evolving criterion for assessing ethanol production mechanism from grains such as maize, damaged food grains like broken rice, surplus rice sourced from FCI etc.

Part-I

Definitions:

1. Sugarcane juice shall mean, primary juice, secondary juice, mixed juice and clear juice only as obtained by sulphitation or defecation process in a vacuum pan sugar factory.
2. Sugar syrup shall mean concentrated sugarcane juice having total dissolved solid content not less than 50° as indicated by brix. Below 50° brix it may be treated as thick juice or juice depending upon the concentration as indicated by brix% in a vacuum pan sugar factory.
3. Sugar for this purpose shall mean white or off-colour or moist sugar having pol percent not less than 98.0 produced by vacuum pan process.
4. B-Heavy molasses shall mean the molasses obtained as a result of curing of B-masseccuite and having purity not less than 50 and 48 in case of plantation white sugar produced by Double Sulphitation Process and raw sugar produced following Defecation Process of Clarification respectively.
5. Grains shall mean maize, damaged food grains like broken rice, surplus rice sourced from FCI.

Part-II

General Recommendations:

1. During sugar season/ethanol year 2023-24, vacuum pan sugar factories & ethanol units to obtain a process validation report from technical institute viz. National Sugar Institute (NSI), Kanpur/Vasantdada Sugar Institute (VSI) Pune or any technical institute designated by Central/State Government, if no such validation has been carried out earlier and in case of any changes made by the sugar factories & ethanol units at their end with respect to processing system and feedstocks.

2. The process validation report is to be provided to the State Excise officials or any competent authority as designated by State Government by the concerned unit.
3. The validating agencies shall also provide a copy of validation report to Directorate of Sugar & Vegetable Oils, Department of Food & Public Distribution, Krishi Bhawan, New Delhi and Oil Marketing Companies on behalf of Ministry of Petroleum & Natural Gas, Government of India within 15 days of undertaking the onsite validation.

4. For Sugar Units:

4.1 In case of a vacuum pan sugar factory, if two separate processing streams, with no inter-connectivity in the processing lines whatsoever, from cane crushing to sugar bagging and molasses storage are available and proper recording of data of two streams with respect to quantities & qualities is made, factory may divert two different types of feed stocks from two streams.

4.2 Validating agency shall specify the loss in sugar recovery due to diversion, sugar recovery during the diversion and estimated sugar recovery considering no diversion of juice/syrup or B Heavy molasses to facilitate calculation of FRP for sugarcane etc. Such figures shall be specified for on-date and to-date data.

5. For Ethanol units (sugar based feedstock/dual feed and Grain based):

5.1 The distilleries i.e. ethanol units shall be operational with one feedstock at a time i.e.

- (a) C-Hy molasses
- (b) B-Hy molasses
- (c) Sugarcane juice/ Sugar syrup/Sugar.
- (d) Surplus rice sourced from FCI
- (e) Damaged Food Grains like broken rice and
- (f) Maize

However, where more than one ethanol processing lines are available in the same ethanol unit, they may use equivalent number of different feedstocks for these processing lines to be operated in parallel, with no inter-connectivity in the processing lines whatsoever, subject to proper recording of data of different processing lines with respect to quantities, qualities and complying with the following conditions:

Storage tanks/silos for each type of feedstock shall be separate and clearly earmarked.

5.2 The ethanol produced through different routes i.e. B-heavy molasses, cane juice, sugar syrup and sugar or from grains such as maize, damaged food grains like broken rice, surplus rice sourced from FCI is to be certified by the concerned state excise department or any authority as designated by Central/State Government with unique Identification Number. Such certificate for grains shall

clearly indicate the type of grain used i.e. Maize, damaged food grains or surplus rice sourced from FCI.

5.3 The quality of the ethanol produced by any of the routes should conform to the desired specifications as per IS 15464 (2022): Anhydrous Ethanol for use in Automotive Fuel or as per the requirement of OMC's. Ethanol content % by volume shall not be below 99.6 at 15.6 deg. C, as specified in bid document of OMCs.

5.4 Although different processing lines may be operated on different feedstocks but only one type of feedstock shall be used at a time in any processing line of the ethanol plant. Connections for feed of other raw materials shall remain disconnected and flanges shall be sealed by the excise officials or any other agency authorized by the state government. This process shall be ensured while switching from one feedstock to another. PTZ (Pan-Tilt-Zoom) cameras shall also be installed to show disconnection of any other feed line(s) except for one in use.

5.5 Each processing line shall have independent system for weighing of feedstocks, fermentation, distillation and de-hydration units. The ethanol receivers for the ethanol produced from each processing line i.e. for each feedstock shall be separate and shall not have any connectivity with other ethanol receivers. PTZ (Pan-Tilt-Zoom) cameras shall also be installed at the ethanol receivers.

5.6 Receiver storage tanks for product i.e. ethanol and denaturation/issue tanks shall also be separate based on use of feedstock and clearly earmarked. Necessary information and approvals shall be sought by the ethanol units from the state excise or other concerned officials for use of storage tanks. There shall be separate issue tanks with each ethanol storage tank but if more than one ethanol storage tanks are connected with ethanol denaturation/issue tanks, then it shall be allowed only after the approval by excise official or agency authorized by state government in writing that all ethanol storage tanks so connected have ethanol from same feedstock.

5.7 In case both the processing lines are operated at a time with different feedstocks, receiver, storage and denaturation/issue tanks shall be separate unit wise having no interconnectivity.

5.8 Changeover from one feedstock to another shall be allowed only after minimum 20 days of operation on a particular feed stock. Further, at least one week advance notice shall be given to the state excise or other concerned officials for changeover of feedstock.

5.9 The ethanol units shall ensure installation of proper measurement/weighing systems and controls on input and output side.


21/11/23

Part-III:

A. Diversion of B-Hy Molasses:

1. The C-Hy and B-Hy Molasses from respective centrifugals to be collected in separate receiving tanks i.e. "run off tanks". The C-Hy molasses and B-Hy molasses "run off" and storage tanks should have proper identification labeling in different colors e.g. for C-Hy molasses the labeling may be in darker brown, whereas, for the B-Hy molasses it can be lighter brown. Similar color coding to be provided for their respective pipe lines in the sugar factory wherever used.
2. Separate pumps with no interconnecting pipe lines to be used for both types of molasses so as to send them to the respective storage tanks available in the vacuum pan sugar factory having proper identification marks. Under the normal circumstances, no underground pipelines shall be used for the purpose.
3. While diverting B-Hy molasses, boiling of C or other down the line massecuite shall not be allowed. Separate storage facilities to be provided for C-Hy & B-Hy molasses and any intermixing of the two different qualities of molasses shall be avoided. However, during the period when B- Heavy molasses is diverted, the vacuum pan sugar factories may be allowed to use the existing C-Heavy molasses storage facilities as per their storage plan already validated by NSI/VSI or any competent authority as designated by State Government and with prior information/approval of the state excise officials. Also, state excise officials to verify that existing C-Heavy molasses tank is fully emptied before storing B-Heavy molasses.
4. If a vacuum pan sugar factory envisages on & off switching to B and C massecuite boiling during the season, earmarked plant and machinery for the two quality of massecuites shall have to be used and use of C massecuite pans, crystallizers and curing facilities etc. shall not be allowed for B massecuite. However, if no C massecuite boiling is to be undertaken during the entire season, the same may be allowed.

The sugar factory shall maintain a record with the State Excise Department regarding the period-wise usage of type of massecuite boiling by it during the season. The said record about the usage of type of massecuite boiling may be made available to DSVO/OMCs, as and when required.

5. Sugar factories to provide Maxwell Bolougne type weighing scales or load cell based weighing system etc. to ascertain the respective molasses sent out of the process house of the sugar factory to the respective storage tanks. Alternatively, the factories may use calibrated mass flow meters with check weighment facility.
6. Like wise to measure and record the consumption of the two types of molasses for ethanol production, separate system for the liquidation to be provided in the respective storage tanks having separate pumps with a Maxwell Bolougne type weighing scale or load cell based weighing system or installing calibrated mass flow meters in the discharge line with check weighment facility i.e. no inter-

connectivity of different tanks earmarked for different quality of molasses shall be allowed. After the flow meters or weighing system, the molasses may be sent out through a common line. Suitable PTZ cameras shall be installed at molasses storage tanks and for molasses weighing station.

7. Proper recording of production, dispatch of each type of molasses is to be made in separate log books on two hourly basis while stock taking to be made on day to day basis by the vacuum pan sugar factory.
8. Each sugar unit/mill shall intimate on monthly basis to Directorate of Sugar & VO regarding the production of Sugarcane Juice/Syrup, B-Hy & C-Hy molasses by it during the period and feedstock wise production of ethanol and supply of ethanol to OMCs through the P-II proforma on NSWS portal.
9. In case, the vacuum pan sugar factory gives an undertaking to produce and divert only B- Heavy molasses, the distilleries as per para (3) may be allowed to use the existing C-Heavy molasses storage and ethanol storage facilities with prior information/approval of the state excise officials or any competent authority as designated by State Government.
10. The important quality parameters viz. Brix, Purity, TRS (Total reducing sugar) content of B-Hy molasses sent from the processing house to be recorded on day to day basis by the sugar mill. Such analysis is also to be carried out and recorded by the vacuum pan sugar factory at the time of dispatch from the storage tanks and by the distillery at the time of its use.
11. B-Hy molasses purity shall not be less than 50 and 48 in case of plantation white sugar produced by Double Sulphitation Process and raw sugar production by Defecation Process of Clarification respectively. An allowance of up to -2% in the purity of B Hy molasses may also be considered if the molasses is kept in storage tanks for over 60 days. For the purpose of sampling, samples of B-Hy molasses shall be drawn both from run off-tank & molasses storage tank for which suitable sampling/tapping points to be provided.
12. The distillery i.e. ethanol unit, to record consumption and stock of molasses, production of ethanol as well as distillation and fermentation efficiency of the plant on daily basis. The distillery i.e. the ethanol unit shall also be required to analyze and record the data with respect to quality of the molasses, including apparent purity and total sugar content on day to day basis. The samples of B-Hy molasses for different parameters and for ethanol content, shall be got analysed once in a fortnight by of NSI/VSI, any NABL accredited laboratory authorized by Central/State government and a record of the same shall be kept. In case of procurement of B-Hy molasses by the ethanol unit from other vacuum pan sugar plants in addition to integrated vacuum pan sugar plant, complete record of the same viz. source, quantity & quality shall be kept.
13. It would be essential to weigh and record the quantity of molasses used and ethanol produced from such molasses to ascertain the yield and potential.

A digital system to record the quantity of molasses used and ethanol produced from such molasses to ascertain the yield and potential may be envisaged by the

sugar mills and such data may be made available to DSVO/OMCs, at least on monthly basis or at a frequency told by the DSVO.

14. Due to the diversion of intermediate molasses i.e. B-Hy molasses instead of the conventional final molasses i.e. C-Hy or C-molasses, additional sugar loss is bound to occur resulting in lowering of sugar recovery by the factory but enhancing the ethanol production. Thus, sugar recovery should be estimated by using the following formula:

$$\text{Sugar Recovery \% Cane} = \text{Pol in Mixed Juice \% Cane} \times \frac{(J - 35.60) K}{0.644J}$$

(Where J is the purity of mixed juice and value of K may be considered as 1.002 for deemed production of plantation white sugar).

15. Vacuum pan sugar factories having distillery or those not having attached distilleries, such factories may be allowed divert /transport/sale B Heavy molasses to other distillery for Ethanol production. However, necessary certification from regional state excise/concerned state officials shall be necessary and required registration in supply chain management portal/information to concerned agencies shall be essential.
16. In case of trade/sale/diversion of B-Heavy molasses as per para 12 above, proper recording of dispatch & receipt with respect to quality (Brix%, Purity and TRS%) & quantity to be maintained by the seller and the purchaser. For a standalone distillation unit undertaking ethanol production, relevant guidelines as in the case of distilleries integrated with sugar factories in respect of storage, weighment, colour coding, maintenance of records, quality of B-heavy molasses shall be applicable.
17. The vacuum pan sugar plant selling the B-Hy molasses in open market shall also be required to submit the monthly record of sales of B-Hy molasses to State Excise, Cane Commissioners and DSVO.
18. The vacuum pan sugar units undertaking diversion of B Hy molasses shall submit every month a consolidated statement about quantity of sugarcane crushed & B Hy molasses produced, pol% sugarcane, sugar recovery lost due to B Hy molasses diversion and actual sugar recovery, quantity of B Hy molasses % cane, quantity of B Hy molasses diverted/sold, its quality in terms of brix, purity and total reducing sugar content to State Excise, Cane Commissioners and DSVO. Similarly, data shall be submitted by the ethanol units with respect to quantity of B Hy molasses utilized during the month, quality in terms of brix, purity and total reducing sugar content, ethanol produced, yield of ethanol/ton of B Hy molasses to State Excise, Cane Commissioners and DSVO.

B. Diversion of Sugarcane Juice/ sugar syrup:

1. Separate calibrated mass flow meters or load cell based weighing scales of appropriate capacity shall be provided in vacuum pan sugar factories to ascertain the quality and quantity of juice/syrup diverted for ethanol production.

2. In case of partial diversion, no any interconnecting pipe lines/by-pass arrangement shall be used. The juice/syrup diverted to the ethanol unit shall be stored in separate storage tanks having proper identification marks with the storage tanks and pipelines in yellow colour. Under the normal circumstances, no underground pipelines shall be used for the purpose of delivering the juice/syrup.
3. Proper recording of juice/syrup dispatches to be made in log books by the vacuum sugar factory. Recording of juice/syrup received, its consumption, ethanol production, distillation & fermentation efficiency, equivalent quantity of sugarcane used for ethanol production and yield of ethanol per ton cane shall be made on daily basis by the distillery. In case of procurement of juice/syrup by the ethanol unit from other vacuum pan sugar plant in addition to integrated vacuum pan sugar plant, complete record of the same viz. source, quantity & quality wise per lot procured shall be kept. The same procedure shall be followed by stand-alone ethanol units. The vacuum pan sugar plant selling the sugarcane juice/syrup in open market shall be required to report the details on monthly basis to State Excise, Cane Commissioners and DSVO. Daily report in respect of juice/syrup received/sold, its consumption, ethanol production, distillation & fermentation efficiency, equivalent quantity of sugarcane used for ethanol production and yield of ethanol per ton cane shall be intimated to DSVO/State Cane Commissioners.
4. Important parameters with respect to quality of diverted juice/syrup viz. Brix, Purity, TRS (Total reducing sugar) content to be recorded four hourly by the sugar factory and distillery. In case, the vacuum pan sugar factory opts for converting the form of sugarcane juice or sugar syrup through inversion & concentration etc., the validating agencies shall validate the process for its suitability, possible ethanol yield & any possible difference in two cases.
5. In case of entire juice/syrup diversion, estimated sugar recovery may be calculated by using the following:

$$\text{Sugar Recovery \% Cane} = \text{Pol in Mixed Juice \% Cane} \times \frac{(J - 35.60)}{0.644 J} K$$

(Where J is the purity of mixed juice and value of K may be considered as 1.002).

6. In case, the sugar factory undertakes partial diversion of juice/syrup, the sugar recovery shall be calculated by taking into account i.e. factorizing, the quantity of juice/syrup diverted and actual purity of final molasses being obtained.
7. The vacuum pan sugar units undertaking diversion of sugarcane juice/syrup shall submit every month a consolidated statement about quantity of juice/syrup produced & diverted or sold, quantity of juice/syrup % cane, quality in terms of purity and total reducing sugar content to the same agency which validates the process. Similarly, data shall be submitted by the ethanol unit with respect to

quantity of sugarcane juice/syrup utilized, quality in terms of brix, purity and total reducing sugar content, ethanol produced, yield of ethanol/ton of sugarcane juice or syrup to the same agency which validates the process, every month.

C. Diversion of Sugar:

1. Proper accounting shall be maintained for sugar dispatches by the vacuum pan sugar factory and consumption of sugar by the distillery on day to day basis.
2. Necessary sugar mingler, melter etc. shall be provided in the distillery along with mass flow meters and check weighment system so as to ascertain flow of sugar melt into the process.
3. Sugar shall be processed exclusively or along with sugarcane juice or sugar syrup only.
4. While processing such sugar along with other feed stocks, proper accounting shall be maintained about sugar dispatches by the vacuum pan sugar mill and consumption of sugar and other feed stock by the distillery on day to day basis.
5. The vacuum pan sugar mill shall also maintain account of sugar diverted for production of ethanol while calculating the sugar recovery.
6. The data regarding receipt of sugar, ethanol production, dispatch and in stock, fermentation and distillation efficiency shall be recorded by the ethanol unit on day to day basis.
7. The ethanol unit, integrated with sugar unit or standalone shall submit a work plan for arriving at ratio of sugar to other feedstocks. The ethanol unit shall keep a complete record of source of procurement of vacuum pan sugar, quantity consumed alone or with other feed stocks, quality of sugar and shall submit details on monthly basis to the State Excise, Cane Commissioners, DSVO & OMCs.

D. Diversion of Specially Denatured Spirit for Ethanol Production:

1. In case a standalone ethanol unit resorts to conversion of Specially Denatured Spirit made from cane juice/syrup/B Heavy molasses/Sugar for production of ethanol, it would be necessary to validate the process through NSI/VSI/other competent authority at the end of sugar factory(s) undertaking diversion of Cane juice/Sugar Syrup/B Heavy molasses/Sugar, distillery(s) producing specially denatured spirit from such diverted stream and also at the end of standalone unit converting such spirit to ethanol.
2. The other modalities mentioned in earlier paragraphs viz. recording of data with respect to purchase and sale, quantity and quality of feed stock & ethanol produced, operational conditions, colour coding and storage etc. shall have to be adhered to by the participating units.

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3. Necessary certification from regional state excise/concerned state official shall be necessary and required registration in supply chain management portal/information to concerned agencies shall be essential.
4. Proper recording of dispatch & receipt with respect to quality of feed stock i.e. cane juice/syrup/B Heavy molasses/Sugar (Brix%, Purity and TRS%, as applicable) & quantity to be maintained by the seller and the purchaser. In addition to this such records with respect to quality and quantity of Ordinary Denatured Spirit (ODS) to be maintained by the seller(s) and the purchaser.

E. Utilization of Grains for Ethanol Production:

1. Adequate storage facilities viz. silos of appropriate capacity shall be provided in case the ethanol units envisage production of ethanol by using surplus rice sourced from FCI, damaged food grains like broken rice and maize for separate storage of each type of feedstock. Suitable PTZ cameras shall also be installed in the grain storage area.
2. Proper accounting for each type of feed stock with regard to source, quantity procured, consumed and in stock shall have to be maintained. Proper records with respect to procurement of each type of feed stock viz. tax/sale invoices etc. shall be maintained.
3. To facilitate the same, the unit shall ensure availability of lorry or other suitable weighbridges to be calibrated from time to time. A record of the calibration shall have to be maintained.
4. The ethanol unit shall also maintain a record of important quality parameters viz. starch, protein and moisture content etc. in the raw material for different lots and also on day to day basis.
5. The data regarding ethanol production, dispatch and in stock, fermentation & distillation efficiency and yield of ethanol per ton of feed stock shall be recorded by the ethanol unit on day to day basis. The distillery unit shall maintain the daily data about the ethanol production, dispatch and in stock, fermentation & distillation efficiency and yield of ethanol per ton of feed stock and such data may be made available to DSVO/OMCs, as and when required.
6. The ethanol unit shall process one category of feedstock at a time. In case of dual feed stock based ethanol units (working on feed stocks from sugar units and grains), they may be allowed to operate on different feed stocks subject to complying with the conditions mentioned in Part II of the guidelines.
7. Separate ethanol storage capacities shall have to be provided for ethanol produced from different feedstocks i.e. surplus rice sourced from FCI, damaged food grains and maize. In case of dual feedstock based ethanol units (working on feedstocks from sugar units and grains), similar considerations shall be applicable and as detailed in Part II of the guidelines.

8. Such ethanol units to get the process validated from NSI/VSI or any competent authority as designated by State Government during each ethanol supply year for the above and ensure production of ethanol with DDGS as being the by-product.
9. Each ethanol unit shall intimate on monthly basis or at a frequency as told by DSVO regarding the feedstock wise production of ethanol and supply of ethanol to OMCs through NSWS portal.

F. Storage capacity of Molasses and Ethanol Tanks:

The ethanol units shall ensure availability of adequate storage capacity to commensurate their operational capacities. These may be considered as 45 days for ethanol and 60 days for molasses in case of standalone ethanol units. For ethanol units integrated with sugar units, these may be considered as 45 days and 30 days for ethanol & molasses respectively. The storage tanks may be allowed to be interchangeably used with due permission of excise or concerned state officials.

G. Power of inspection, entry, search, sampling etc.:

The Central Government has the right to conduct surprise inspection of the sugar mill/distillery unit or to inspect any books or any relevant documents including electronic records in order to ascertain whether the aforesaid guidelines are strictly complied with.

Note:- Though, It is mentioned in above Guidelines to submit data by Distilleries/Sugar mills on monthly basis to DSVO. At first, data should be submitted by email at [mis-ethanol@gov.in] and then, online using APIs after development of online portal for this purpose.


21/11/23