



شرکت پالایش نفت امام خمینی (ره) سازند (سای مام)

آگهی فراخوان مناقصه عمومی دو مرحله ای شماره RND-0318024-MH تحت عنوان

خرید کاتالیست هیدروکراکر

شرکت پالایش نفت امام خمینی (ره) سازند در نظر دارد تامین کالای موضوع صدرالاشاره را از طریق مناقصه عمومی طبق اسناد مناقصه به تامین کننده واجد شرایط واگذار نماید. شرکتهای متقاضی می توانند جهت دریافت اطلاعات بیشتر و شرایط شرکت در مناقصه به سایت WWW.IKORC.IR مراجعه نمایند.

۱- موضوع مناقصه :

(الف) شرح مختصر:

ردیف	شماره مناقصه	موضوع مناقصه	مقدار	مبلغ برآورد (ریال)	مبلغ تضمین شرکت در مناقصه (ریال)
01	RND-0318024-MH	کاتالیست هیدروکراکر (Isomax Catalyst)	۳۷۵ مترمکعب	۷,۷۱۷,۰۰۰,۰۰۰,۰۰۰	۷۷,۵۴۸,۰۰۰,۰۰۰

ب) تضمین مورد قبول شامل : ضمانتنامه بانکی / چک تضمینی / چک بین بانکی / واریز وجه نقد
ج) شرکت در رد یا قبول هر یک یا تمام پیشنهادهای بدون آنکه محتاج به ذکر دلیل باشد مختار است.

۲) کلیه اشخاص حقوقی واجد شرایط میتوانند مطابق تاریخ های ذیل جهت دریافت اسناد استعلام ارزیابی به آدرس اینترنتی فوق الذکر مراجعه نمایند و پس از دریافت اسناد و مطالعه آن ، مستندات ارزیابی کیفی را در قالب لوح فشرده در مهلت مقرر به آدرس ذیل ارسال نمایند . بدیهی است پیشنهاد هایی که با شرایط مندرج در فراخوان اختلاف داشته و ارسال مدارک مناقصه از سوی متقاضیان بعد از مهلت مقرر قابل پذیرش نمی باشد. پس از ارزیابی کیفی از متقاضیان تأیید شده جهت ادامه فرآیند مناقصه دعوت بعمل خواهد آمد.

۳) مهلت دریافت اسناد :

۳-۱- مهلت دریافت اسناد استعلام ارزیابی کیفی: روز چهارشنبه مورخ ۱۴۰۳/۰۸/۰۲

۳-۲- مهلت ارسال پاسخ استعلام ارزیابی کیفی: روز دوشنبه مورخ ۱۴۰۳/۰۸/۱۴

۴) نام و نشانی دستگاه مناقصه گز: اراک، کیلومتر ۲۰ جاده بروجرد- دو راهی سازند- شرکت پالایش نفت امام خمینی (ره) سازند- اداره تدارکات کالا- اتاق ۱۱۸

تلفن تماس: ۰۸۶-۳۳۴۹۲۸۴۲ و ۰۸۶-۳۳۴۹۲۸۴۰ یا ۰۸۶-۳۳۴۹۲۸۴۰

فکس: ۰۸۶-۳۴۱۶۶۲۴۳ یا ۰۸۶-۳۴۱۶۶۰۱۳

روابط عمومی شرکت پالایش نفت امام خمینی (ره) سازند

* آخرین مهلت اعلام آمادگی: ۱۴۰۳/۰۸/۰۲ (از طریق فکس یا ایمیل)

* آخرین مهلت تحویل CD مدارک ارزیابی کیفی، پایان وقت اداری روز دوشنبه مورخ ۱۴۰۳/۰۸/۱۴ اعلام می گردد. (از طریق پست)

آدرس پست الکترونیکی: PROCUREMENT@IKORC.IR شماره تلفن تأییده فاکس و ایمیل: ۰۸۶-۳۳۴۹۲۸۳۰



شرکت پالایش نفت امام خمینی (ره) شازند (سهامی عام)

شرکت / فروشگاه محترم مناقصه عمومی دو مرحله‌ای شماره : RND-0318024-MH

لطفاً به منظور انجام ارزیابی کیفی آن شرکت / فروشگاه ، طبق جداول و محاسبات پیوست مدارک و مستندات ذیل را ارائه فرمایید:

۱- جهت ارزیابی توان مالی

الف : مدارک مورد نیاز جهت ارزیابی حداقل یکی از موارد ذیل:

- ۱-الف : مالیات متوسط سالانه پرداخت شده (برگ تشخیص/ قطعی مالیات عملکرد ۱۰ سال اخیر).
- ۲-الف : فروش یکسال گذشته (لیست خریداران شامل نام خریدار ، شرح کالا، مبلغ کالا) مستند به قراردادهای و اسناد فروش با صورت های مالی تأیید شده.
- ۳-الف : مالیات متوسط سالانه مستند به اسناد مالیات های قطعی و علی الحساب پرداخت شده .
- ۴-الف : حداکثر تائیدیه کتبی اعتبار از طرف بانکها.
- ۵-الف : دارائیهای ثابت.
- ۶-الف : متوسط بیمه سالانه (برای قراردادهای پیمانکاری).

امتیاز	فرمول
۱۰۰	$1/2 \times ES \leq RI$
۹۰	$ES \leq RI < 1/2 \times ES$
۸۰	$1/8 \times ES \leq RI < ES$
۷۰	$1/6 \times ES \leq RI < 1/8 \times ES$
۶۰	$RI < 1/6 \times ES$

۲- جهت ارزیابی حسن سابقه / مشتریان قبلی / تضمین کیفیت و تضمین خدمات محصولات مدارک ذیل مورد نیاز است :

- الف : کیفیت کالای مورد نظر (ارائه مدارکی مبنی بر فروش کالای مورد نظر به خریداران/ ارائه مدارکی مبنی بر تطابق مشخصات فنی ارائه شده از سوی فروشنده با کالای مورد نظر)
- ب : ارائه استانداردها و گواهی تضمین کیفیت ساخت کالای مورد نظر فروخته شده (در صورت موجود بودن)
- ج : ارائه مدارک مربوطه در خصوص دارا بودن نمایندگی
- د : ارائه تائیدیه کالای فروخته شده

۳- جهت ارزیابی تجربی مدارک ذیل مورد نیاز است :

- الف : ارائه اساسنامه شرکت یا پروانه کسب
- ب : ارائه شماره اقتصادی / کد ملی

مناقضه عمومی دو مرحله‌ای شماره : مناقضه عمومی دو مرحله‌ای شماره : RND-0318024-MH

۴ - قیمت تراز شده به نحوه زیر محاسبه میگردد و تعیین برنده پس از بررسی قیمت تراز شده انجام خواهد شد:

$$L = \frac{100 \times C}{100 - [i \times (100 - t)]}$$

L = قیمت تراز شده

C = قیمت پیشنهادی (درج شده در پاکت قیمت)

i = ضریب تاثیر (بین ۰.۱ تا ۰.۴) ۰.۴

t = امتیاز کل فنی بازرگانی (بین حداقل امتیاز فنی بازرگانی قابل قبول تا صد)



تاریخ:

شرکت بالایش نفت امام خمینی (ره) سازند (سهامی عام)
فرم ارزیابی تأمین کنندگان / سازندگان / تولید کنندگان کالا

مناقشه عمومی دو مرحله‌ای شماره: RND-0318024-MH نام شرکت:

تحت عنوان: خرید کاتالیست هیدرو کراکر

A: توان مالی

ارزیابی بر اساس یکی از پارامترهای ذیل انجام می شود:

<input type="checkbox"/> درآمد / فروش سالانه	<input type="checkbox"/> اظهار نامه مالیاتی	<input type="checkbox"/> متوسط مالیات سالانه
<input type="checkbox"/> دارایی های ثابت	<input type="checkbox"/> تأیید کتبی اعتبار بانکی	<input type="checkbox"/> متوسط بیمه سالانه
<input type="checkbox"/> صورتهای مالی حسابرسی شده: دارد <input type="checkbox"/> ندارد		میزان توان مالی
امتیاز کسب شده:		میلیارد ریال
۱۰۰ <input type="checkbox"/> ۹۰ <input type="checkbox"/> ۸۰ <input type="checkbox"/> ۷۰ <input type="checkbox"/> ۶۰ <input type="checkbox"/> ۵۰ <input type="checkbox"/> ۴۰ <input type="checkbox"/> ۳۰ <input type="checkbox"/> ۲۰ <input checked="" type="checkbox"/>		

حداقل امتیاز لازم: ۷۰

B: ارزیابی مشتریان قبلی، حسن سابقه و تضمین کیفیت و خدمات محصولات

پارامترهای ارزیابی	عالی امتیاز ۵	بسیار خوب امتیاز ۴	خوب امتیاز ۳	مورد تأیید نیست
کیفیت گالای مورد نظر مندرج در اسناد فنی ارائه شده		*		
خدمات و پشتیبانی			*	
انجام تعهدات (گارانتی)			*	

$$(10 \div 15) \times 100 = 66.67$$

امتیاز ۶۷

C: ارزیابی تجربی

سال تأسیس:

امتیاز	سابقه	
۱۰۰	بیش از ۱۰ سال سابقه	تولید کننده / سازنده کالا
۹۰	۵ سال تا ۱۰ سال سابقه	
۸۰	با کمتر از ۵ سال سابقه	
۸۰	بیش از ۱۰ سال سابقه	تأمین کننده کالا
۷۰	۵ سال تا ۱۰ سال سابقه	
۶۰ *	با کمتر از ۵ سال سابقه	

امتیاز سازنده کالا / تولید کنندگان: -

امتیاز تأمین کننده کالا: ۶۷

اولویت معیارها:

۲	A
۱	B
۲	C

$$\text{فرمول} = 0.4(A+C) + 0.2(B)$$

فرمول

امتیاز سازنده / تولید کننده کالا:

امتیاز تأمین کننده کالا:

$$0.4 + 0.2 + 0.4 = 1.0$$

بر اساس ارزیابی مدارک فوق شرکت مذکور مورد تأیید می باشد ☐

به دلیل عدم ارائه مدارک ذیل، شرکت مذکور مورد تأیید نمی باشد ☐

۱- عدم ارائه مدارک مالی ☐

۲- عدم ارائه مدارک حسن سابقه و .. ☐

۳- عدم ارائه مدارک تجربه و سوابق مربوط ☐

مشخصات فنی و اطلاعات مربوطه:

خرید کاتالیست هیدروکراکر

ردیف	شرح :	واحد	مقدار
۱	کاتالیست هیدروکراکر (Isomax Catalyst)	مترمکعب	۳۷۵

تامین کننده های داخلی می بایست کاتالیست را از شرکت های تولید کننده بین المللی مورد تایید به

شرح ذیل تامین نمایند:

Albermarle – ۱

Holder Topsoe – ۲

Beet, – ۳

SGC – ۴

کاتالیست می بایست بصورت استاندارد در بسته بندی مناسب (ترجیحا بشکه) غیر قابل نفوذ در برابر رطوبت و گرد و غبار و بر روی پالت متناسب با وزن کالا، تسمه کشی و شیرینگ پک شده باشد. ضمنا کلیه مشخصات وزنی، فنی، تاریخ تولید و انقضاء و نیز موارد مورد نیاز ایمنی به صورت واضح و قابل رویت بر روی بدنه جانبی چاپ گردد.

در صورتیکه بسته بندی به صورت Big Bag یک تنی باشد می بایست ابتدا محموله داخل کارتن و سپس داخل Big Bag قرار گرفته و پوشش پلاستیکی مناسب و مقاوم بر روی آن قرار گیرد. بسته بندی ها بایستی مقاوم در برابر نور مستقیم آفتاب و نفوذ باران باشد. همچنین با توجه به تنوع کاتالیست ها و به

منظور جلوگیری از بروز اشتباه در عملیات بارگیری کاتالیست، بایستی برای هر نوع کاتالیست و یا گارد کاتالیست یک مشخصه بارز مانند رنگ متفاوت بشکه یا رنگ برچسب های بشکه های کاتالیست با قابلیت تمایز از فاصله دور فراهم گردد.

میزان جریمه تاخیر معادل یک دهم درصد از مبلغ کل قرارداد به ازای هر روز تاخیر.

۱۸ ماه گارانتی

توضیح معیارهای ارزیابی فنی:

مباحث فنی مطابق مدارک فنی مد نظر قرار گرفته است. لازم به ذکر است، کیفیت کاتالیست از لحاظ استحکام، دانسیته، فعالیت و... مورد ارزیابی قرار خواهد گرفت. همچنین با توجه به محدودیت های فرآیندی و مباحث مدیریت انرژی شرایط عملیاتی و فرآیندی عملکرد کاتالیست از جمله دمای واکنش، فشار، بازده حجمی تولید محصولات و در ارزیابی ها ملاک عمل خواهند بود.

ظریب تاثیر جهت قیمت تراز شده: ۰.۴

حداقل امتیازات پیشنهادات فنی قابل قبول: ۶۰

شرح فنی کاتالیست (۲۵ برگ):

TECHNICAL SPECIFICATIONS AND PROCUREMENT CRITERIA FOR HCU CATALYSTS

**Process Eng. Department (HCU Section)
IKORC Iran, Arak-Shazand**

مشخصات فنی و اطلاعات مربوطه

موارد فنی و الزامات فروشنده:

- بسته بندی کاتالیست در بشکه های فلزی بر روی پالت به همراه پوشش نایلونی در داخل بشکه برای جلوگیری از نفوذ رطوبت به داخل کاتالیست صورت پذیرد. در صورتیکه بسته بندی به صورت Big Bag یک تنی باشد می بایست ابتدا محموله داخل کارتن و سپس داخل Big Bag قرار گرفته و پوشش پلاستیکی مناسب و مقاوم بر روی آن قرار گیرد. بسته بندی ها بایستی مقاوم در برابر نور مستقیم آفتاب و نفوذ باران باشد. همچنین با توجه به تنوع کاتالیست ها و به منظور جلوگیری از بروز اشتباه در عملیات بارگیری کاتالیست، بایستی برای هر نوع کاتالیست و یا گارد کاتالیست یک مشخصه بارز مانند رنگ متفاوت بشکه یا رنگ برچسب های بشکه های کاتالیست با قابلیت تمایز از فاصله دور فراهم گردد.
- با توجه به اینکه سازندگان کاتالیست، در پیشنهاد فنی خود از چندین نوع کاتالیست با دانسیته متفاوت استفاده می نمایند؛ لذا وزن مجموع کاتالیست ها متغیر بوده که این امر تأثیر زیادی در قیمت پیشنهادی ایجاد خواهد نمود. بنابراین جدول پیشنهاد مالی پس از بررسی و ارزیابی فنی پیشنهادها توسط مناقصه گذار برای هر یک از مناقصه گران ارسال خواهد شد. مناقصه گران می بایست پیشنهاد مالی خود را بر اساس جدول مذکور ارائه نمایند. ملاک برنده شدن در مناقصه، قیمت نهایی اعلام شده در جدول مذکور پس از تراز شدن (با توجه به امتیازات فنی) خواهد بود.
- بررسی و انجام تست های آنالیز هر یک از انواع کاتالیست و در نهایت تأیید فنی آنها، زمانی انجام می پذیرد که کل محموله از آن نوع کاتالیست تحویل شده باشد. در صورت مغایرت آنالیزهای انجام شده بر روی محموله ارسال شده با اطلاعات فنی کاتالیست از قبیل دانسیته، میزان LOI کاتالیست و ... ارائه شده در پیشنهاد فنی اسناد مناقصه که منجر به تحمیل هر گونه هزینه اضافی به شرکت پالایش نفت امام خمینی (ره) شازند گردد؛ کلیه هزینه های مازاد تحمیل شده می بایست توسط فروشنده بدون هیچ گونه قید و شرطی جبران گردد.
- تولید کنندگان کاتالیست می بایستی در پیشنهاد فنی خود، میزان انرژی مورد نیاز کاتالیست به منظور تأمین دمای انجام واکنش ها (هزینه سوخت مصرفی در کوره قبل از راکتور) در طول دوره کارکرد کاتالیست (از زمان SOR تا EOR) را اعلام نمایند. هزینه انرژی مصرفی کمتر مورد نیاز کاتالیست پیشنهادی، امتیاز بالاتری در این قسمت کسب خواهد نمود.

- فروشنده کاتالیست موظف به برگزاری دوره های آموزشی و بازدید از واحدهای استفاده کننده کاتالیست تولیدی، در شرکت های بین المللی برای حداقل 20 نفر از کارشناسان معرفی شده از جانب خریدار در طی مدت اجرای قرارداد می باشد..

- فروشنده می بایست برنامه زمان بندی تولید کاتالیست را پس از عقد قرارداد به خریدار ارسال نماید. پس از مشخص شدن برنده مناقصه و پس از ابلاغ شروع قرارداد، کارشناسان خریدار در صورت لزوم، از خط تولید صنعتی شرکت برنده مناقصه، بازدید به عمل آورده و نمونه گیری از کاتالیست جهت انجام تست های لازم به عمل می آید و امکان و ملزومات این بازدید می بایست توسط فروشنده فراهم گردد. بنا به تشخیص کارفرما ممکن است نمونه کاتالیست تولیدی شرکت های تولیدکننده در حضور کارشناسان پالایشگاه، تولید و با توجه به شرایط عملیاتی مورد درخواست، تست پایلوت انجام گیرد.

- جهت بازرسی و تأیید فنی کاتالیست به شیوه زیر عمل می گردد:

- 1 - پس از تولید کامل محموله کاتالیست (حداکثر در سه محموله به طوری که در هر نوبت، تمامی مقدار یک نوع کاتالیست تولید و آماده شده باشد) در محل انبار شرکت تولید کننده و درحضور نمایندگان کارفرما و تأمین کننده و با روش استاندارد تعریف شده، نمونه گیری از کاتالیست انجام و توسط نماینده کارفرما پلمپ لازم انجام گیرد. (کلیه هزینه های مربوط به حضور کارفرما در محل کارخانه تولید و انجام نمونه گیری به عهده تأمین کننده می باشد)

- 2 - نمونه تهیه شده توسط تأمین کننده به داخل کشور انتقال یافته و پس از فک پلمپ توسط کارفرما جهت انجام آنالیزهای لازم به آزمایشگاه معتمد ارسال می گردد. (هزینه انجام تست به عهده کارفرما خواهد بود)

- 3- پس از مشخص شدن نتایج آنالیز و بررسی فنی توسط کارشناسان کار فرما در صورت تأیید فنی و اعلام کتبی آن به تأمین کننده ، کالا به مقصد ایران حمل و پرداختها بر اساس اسناد مثبت و مطابق قرارداد انجام خواهد شد.

انجام بازرسی به تشخیص و درخواست کارفرما و هزینه فروشنده می تواند توسط بازرس شخص ثالث صورت پذیرد.

- برگه اطلاعات ایمنی مواد (MSDS) برای هر یک از کاتالیست ها بایستی توسط فروشنده/سازنده به خریدار تحویل گردد.

- مشخصات کالا بایستی به طور کامل بر روی بسته بندی درج گردد.

- ضمن رعایت الزامات HSE، ریسک ها و مخاطرات بهداشتی ماده فوق باید توسط فروشنده ارائه گردد.
- فروشنده فقط مجاز است که یک بار پیشنهاد فنی خود را ارسال نماید. لذا ضروری است که در ارسال پیشنهاد فنی خود، دقت و توجه کافی را مبذول دارند. جداول و اطلاعات مورد نیاز خریدار که در بخش پیشنهاد فنی آورده شده است؛ بایستی به طور کامل برای هر نوع از کاتالیست و دقیقا مطابق با فرمت ارائه شده تکمیل و ارسال گردد. به منظور ارزیابی فنی کاتالیست، لازم است که اطلاعات جداول به طور کامل و دقیق ارائه گردد. در ارائه اطلاعات مورد نیاز تا حد امکان از ذکر دامنه اعداد و استفاده از علائم کوچک تر یا بزرگ تر بخصوص در مورد دانسیته، مشخصات فیزیکی و درصد وزنی فلزات به کار رفته در کاتالیست پرهیز گردد. تأکید می گردد پیشنهادات فنی که مطابق با فرمت ارائه شده ارسال نگردند؛ مورد بررسی قرار نخواهد گرفت.

TECHNICAL SPECIFICATIONS & PROCUREMENT CRITERIA FOR HCU CATALYSTS

1. Definition
2. Introduction
3. Prequalification Criteria
4. Process Description
5. Feed and Hydrogen stream Specifications
6. Catalyst Performance
7. Unit Design & Operating Conditions and Constraints

- 8. Scope of Supply and Services
- 9. Evaluation Criteria

Section 1: Definition

- **Buyer:** shall mean Imam Khomeini Oil Refining Company (hereafter referred to as IKORC), incorporated and existing under Islamic Republic of Iran law which is located at 20th km of Arak-Broujerd road, Markazi province, Iran.
- **Supplier:** shall mean any supplier/vendor who shall be responsible for supplying the catalyst.
- **HCU:** UOP Unibon Hydrocracker Unit which has originally designed and licensed by UOP includes 3 parallel reactors to process 24500 BPSD of Straight Run Waxy Distillate from VDU plus 60% UCO recycle (14700 BPSD) having 97 wt.% conversion per fresh feed with guaranteed outlet products quality and specifications.
- **Purchase order (P.O.):** means the binding agreement between buyer and catalyst supplier for the supply of HCU Amorphous catalyst and additional services as described in the "Purchase Order Documents".

Section 2: Introduction

Imam Khomeini Oil Refining Company (IKORC) is a company involved in refining and production of petroleum products.

Hydrocracker unit (HCU) at IKORC Refinery, commissioned in 1990 under IKORC Refinery Grassroots Project by JGC Company, has an installed capacity of 24500 BPSD. The unit is licensed by UOP, UK. The unit has Three Parallel reactors, each one in four subsequent beds with intermediate Hydrogen quenches. Total catalyst volume of all three reactors is approximately 275 m³ and each reactor first bed loaded with hydrotreatment catalyst while three other subsequent beds are to be loaded with Hydrocracking catalyst. Feed to HCU are Straight run Waxy Distillate from Vacuum Distillation Unit (VDU) and Unconverted Oil (UCO) recycled from distillation section of this unit.

IKORC Refinery intends to replace the full charge of HCU catalyst with fresh and new catalyst from competent hydrocracking & hydro-treatment catalyst manufacturer.

2.1 STATEMENT OF PURPOSE

Design levels as mentioned in Tender for Feed conversion and Product Quality are desired. Proposals from vendors shall contain all relevant information as requested in this document.

The processing objective is to:

- **produce Unconverted Oil (UCO) in the range of about 3 Vol.% FF to 50 Vol.% FF** because of the downstream units feed's requirements, which meets the products quality requirements mentioned in the Tables below, and the vendor shall consider this limitation in the proposed catalyst.

- Design Combined Feed Ratio (CFR) (CFR equals to Total Feed (Fresh Feed + Recycle Feed)/Fresh Feed) is 1.6, which may vary **between 1.4 to 1.6**.
- **Design Fresh Feed rate of HCU unit is 162.3 m³/hr which will be increased up to 180 m³/hr.**
- **H₂/HC minimum shall be 1000 Nm³/m³ FF.**
- **Design pressure is 182.7 Barg which will be decreased to 155 Barg min.**
- **The proposed catalyst shall be capable to withstand these constraints without potential Coke Formation**

Under normal operation, the unit will be in Recycle mode with 60% recycling of unconverted oil (LSFO) back to fresh feed surge drum.

The feed basis terms and conditions of reference, product yields & qualities, general description, Design & Operating constraints, scope of supply & services, scope of work, performance guarantees, penalties and etc. are as follow in the subsequent sections of the document.

Section 3: Pre-Qualification Criteria (PQC)

3.1 Technical Criteria

- All the Catalyst brands offered by the Vendor should have been successfully passed in a performance Guarantee test run (PGTR) or a proof of its established satisfactory performance.
- Vendor shall provide a **Hydrocracker Amorphous catalyst with mild activity** to produce high UCO quantity under mild operating conditions. Also our priority is to utilize Ni-Mo catalyst rather than Tungsten (W) in the structure of the catalyst.
- The catalyst supplier shall provide reference units regarding successful and satisfactory performance of the offered catalyst(s) for the HCU process in units operating under similar conditions. In the event of receipt of non-satisfactory performance, the catalyst(s) offered will deem to be technically disqualified and this offer will not be considered for further evaluation. Reference details including the feed/products quality, operating conditions and catalyst performance report shall be attached.

3.2 General Points

- On receipt of product, samples will be drawn for testing in our laboratory and if found not to be in accordance with our specifications, the catalyst will not be accepted.
- Bidder shall submit detailed information along with the offer regarding the direct/indirect impact of their products on people, equipment, environment, materials. Material Safety Data Sheets to be submitted with the technical bid.
- The material shall be packed in accordance with the rule in weatherproof, shipment worthy eco-friendly packing, labeled and indicating clearly the description of item, hazardous nature if any precautions/care to be taken.
- Offers and all correspondence must be presented in English language.
- The commercial terms offered by the bidder should be firm, clear and specific as the tenders shall normally be finalized without seeking further clarification.
- Selected bidder has to confirm free replacement will be done if the supplied material rejected.

- After evaluation of the documents, visiting catalyst production plant may be necessary for final technical approval.
- Vendor should note that catalyst will be loaded at the time determined by IKORC. Guarantees will hold valid from the time whenever feedstock is introduced for the first time.
- Safe disposal procedure of generated spent catalyst after EOR as per international safety standards should be provided. Catalyst Vendor shall specify the standard and detailed procedures for unloading and disposal of spent catalysts, and also MSDS documents for the catalyst.
- Prior to delivery of each batch of catalyst, third party inspection should be done. Only after accepting third party inspection report by IKORC, delivery would be possible. Third party inspection report must include, but not limited to catalyst physical and chemical properties, packaging condition, appearance and labeling. All expenses for sampling test and reporting of third-party inspection to be considered in catalyst price.
- Catalyst supplier should accept not duplicate or disclose IKORC operating data and reports to any third party.

Section 4: Process Description

HCU Unibon Process is designed to process 24,500 BPSD of waxy Distillate Oil from Vacuum Distillation Unit. The UOP HC Unibon Process is a versatile process for catalytically hydrocracking heavy petroleum fractions into lighter, more valuable products. The HC Unibon feedstock is the waxy distillate fraction from the Vacuum Distillation Unit. This feed is converted to lower molecular weight products like LPG, Light Naphtha, Heavy Naphtha, Kerosene, and Diesel. Simultaneously with the hydrocracking, Sulfur, Nitrogen, and Oxygen are almost completely removed and Olefins are saturated, thereby giving products which are a mixture of essentially pure Paraffins, Naphthenes and Aromatics.

The desired degree of hydrocracking takes place as the feed is processed over fixed beds of DHC type catalyst at elevated Hydrogen pressure and temperature. The amount of catalyst required per volume of fresh feed and the pressure level required depends on the nature of the feed and the products desired. The reactor circuit pressure ranges from 155-180 Barg (current operating pressure is 155 Barg). As the feed and Hydrogen contact the catalyst, Nitrogen compounds are converted to ammonia, sulfur compounds are converted to Hydrogen sulfide and the higher molecular weight hydrocarbon feed is hydrocracked into the lower molecular weight products. The effluent from the reactors is charged to a fractionation section where the products and byproducts are separated. The actual process conditions (i.e., pressure, LHSV, Hydrogen circulation, etc.) can vary considerably as dictated by feedstock quality and desired products based on the offered catalyst performance.

Feed and treat gas (combination of recycle H₂ and make-up H₂) are heated up in three parallel passes, firstly by feed/effluent exchangers, followed by a fired heater H-630, H-631 and H-632 before entering reactors R-630, R-631 and R-632. The 3 reactors are identical and parallel in configuration. Each reactor contains 4 catalyst beds with inter-bed quenching facility. The reactor effluent is cooled via heat exchangers with reactor feed and air cooling before entering the high pressure separator, V-633 at 182 Barg and 54 °C according to design conditions. Wash water is injected upstream of the air cooler. Also three parallel reciprocating compressors C-601 A/B/C will provide the make-up Hydrogen to upstream of this air cooler. Gas from V-633 is Hydrogen-rich gas stream routed to a centrifugal recycle gas compressor C-602. Recycle gas H₂ purity is regulated minimum 85% H₂ by make-up H₂.

The liquid products from V-633 are passed through low pressure liquid separator, V-636. Liquid from this Vessel is then preheated by exchangers with combined reactor effluent stream, flashed in recycle splitter feed flash drum and further heated up in fractionator feed furnace H-633 and then routed to product fractionators V-639.

The fractionation section consists of the following sections.

- (1) Sponge Absorber tower, V-638
- (2) Recycle Splitter V-639 with Side Cut Strippers: Diesel stripper, V- 644; Kerosene stripper, V-643; and Heavy Naphtha stripper, V-642
- (3) Gasoline Stabilizer, V-645

Light products and light Naphtha are taken overhead in the recycle splitter, V-639. Other products such as heavy Naphtha, Kerosene and Diesel are produced as fractionator side cuts.

The recycle splitter overhead then goes to the stabilizer column, V-645 where it is separated into light Naphtha, LPG and light gases.

Fractionation Circuit:

The products and their True Boiling point range are as follows:

- a) Overhead Off-gas
- b) Liquefied Petroleum Gas (LPG)
- c) Light Naphtha stream, WLN (C5 ~ 85 °C)
- d) Heavy Naphtha stream, HN (85 ~ 160 °C)
- e) Kerosene stream, HCK (160 ~ 265 °C),
- f) Gas oil stream, HCD (265 ~ 366 °C)
- g) Unconverted Low Sulfur Fuel Oil stream, UCO (> 366 °C)

Section 5: Feed and Hydrogen Stream Specification

5-1 Feed Specification

- ✓ The quality of fresh feed is given in this Table:

Property	Value	Test method
Spec. Gravity, @ 15°C	0.9123	ASTM D-1298
Distillation		ASTM D-1160
IBP, °C	343	
50%, ° C	435	
95%, ° C	503	
FBP, ° C	516	
Sulfur, wt%	2.4 max.	UOP 707
Total Nitrogen, wt. ppm	1300 max.	ASTM D-4629
Ni+V, wt.ppm	3 max.	UOP 389
C7 insolubles, wt%	0.05 max	UOP 614
Con. Carbon, wt%	0.5 max.	ASTM D-189

- ✓ Catalyst supplier to provide the impact of the changes in each feed parameter on the guarantee in the form of correlations and/or graph.

- ✓ Feed properties which are not provided in this tender and may be critical for catalyst performance will be clarified by Catalyst supplier (Table 1); otherwise no claim on performance penalties would be accepted.

Table 1 – Typical Feedstock Properties

	UNITS	
DENSITY @ 15.6°C	kg/L	
SULPHUR	wt%	
NITROGEN	wppm	
CCR	wt%	
Iron	wppm	
Nickel	wppm	
Vanadium	wppm	
Mono-aromatics	wt%	
Di-aromatics	wt%	
Tri-aromatics	wt%	
TEST METHOD		TBP
BASIS		Vol%
SOURCE		
IBP	°C	
5%	°C	
10%	°C	
20%	°C	
30%	°C	
40%	°C	
50%	°C	
60%	°C	
70%	°C	
75%	°C	
80%	°C	
90%	°C	
95%	°C	
98%	°C	
FBP	°C	

5-2 Make-up Gas quality

The typical properties and composition of make-up/recycle Hydrogen are provided in the following tables. It shall be noted that minimum value of recycle gas H₂ purity is 85 mol% and in start-up condition, this value is min. 60 mol%. For H₂ make-up gas, the minimum value shall be considered as 90 mol%. All catalysts proposal should be based on this information.

Typical Make-up H₂ and recycle gas stream composition

Composition	mol %
-------------	-------

Hydrogen	99.9 (90 min.)
CO+CO₂	Max 15 mol ppm

	Recycle Gas	Make-up Gas
C1	2.91	0.73
C2	0.63	0.61
C3	0.33	0.37
IC4	0.15	0.10
NC4	0.09	0.06
IC5	0.04	0.02
NC5	0.01	-
C6+	-	-
H2	93.94 (85 min.)	98.11 (90 min.)
H2S	1.90	-
MW	3.52	2.55

Section 6: Catalyst Performance

6-1 Product Specification

Product Quality (must guarantee)

Vendors shall submit the product qualities as per the following format in the technical bid for design case at the EOR condition.

- HC Light Naphtha:**

Properties	Expected	Guarantee
Specific Gravity@ 15°C/15°C	0.6761	
TBP cut range, °C	C5- 85	
ASTM distillation, °C:		
IBP	37	
10%	48.9	
30%	55.6	
50%	65.7	
70%	69.1	
90%	71.7	
EP	79.7	90.6 max.
Sulfur, wppm	10	
Mercaptan sulfur, wppm	5	
Reid vapor pressure, bar absolute	0.66	0.93 max.
Research octane number (clear)	75	73 min.
Research octane number (3 cc TEL)	92	
Sodium content, wppm	nil	1.0 max.

- HC Heavy Naphtha:**

Properties	Expected	Guarantee
specific gravity@ 15°C/15°C	0.7547	
TBP cut range, °C	85 - 160	
ASTM distillation, °C:		
IBP	82.2	
10%	97.8	
30%	108.9	
50%	116.7	
70%	125.6	
90%	137.8	
EP	160.0	
sulfur, wppm	10	15 Max
Mercaptan sulfur, wppm	5	
Reid vapor pressure, bar absolute	0.15	
PNA, liquid vol%	37/55/8	
Research octane number (clear)	61	
Research octane number (3 cc TEL)	80	
Total Nitrogen, wppm	< 2	

- Kerosene:**

Properties	Expected	Guarantee
Specific gravity@ 15°C/15°C	0.7972	
TBP cut range, °C	160-265	
ASTM distillation, °C:		
IBP	155	
10%	177	
30%	191	
50%	201	
70%	211	
90%	227	
EP	253	
Sulfur, wppm	10	
Mercaptan sulfur, wppm	5	5 max.
Flash point, °C	46.1	43.3 min.
Smoke point, mm	30	27 min**
Color (Saybolt)	+30	
Viscosity@ 37.8°C, cst	1.35	
Viscosity@ 98.9°C, cst	0.75	
Aromatic content, vol%	10	15 max**
Aniline point °C	63	
Cloud point, °C	-50	
Freeze point, °C	-54	-50 max.

• **Diesel:**

Properties	Expected	Guarantee
Specific gravity@ 15°C/15°C	0. 8212	
TBP cut range, °C	265-366	
ASTM distillation, °C:		
IBP	233	
10%	264	
30%	285	
50%	299	
70%	316	
90%	339	
EP	377	
Sulfur, wppm	10	
Flash point, °C	93	54.4 min.
Color (Saybolt)	+30	
Pour point, °C	-12	-12 max.
Diesel index	65	55 min.
Cetane index	65	57 min.
Viscosity@ 37.8°C, cst	4.0	
Viscosity@ 98.9°C, cst	1.6	

• **Unconverted Oil:**

Properties	Expected
Specific gravity@ 15°C/15°C	0.8413
TBP cut range, °C	366 +
ASTM distillation, °C:	
IBP	346
10%	386
30%	410
50%	427
70%	446
90%	473
EP	516
Sulfur, wppm	100
Flash Point, °C	>150
Color (ASTM D-1509)	4
Pour Point, °C	20
Viscosity@ 37.8°C, cst	38
Viscosity@ 98.9°C, cst	6.7

Metal Content, wppm:	
Nickel	nil
Vanadium	nil
Iron	nil
Total Nitrogen, wppm	<5

Section 7: Unit Design & Operating Conditions and Constraints

The unit is operating with three parallel reactor trains, 3 reactors, each one having 4 beds total having a total catalyst volume of approximately 275 m³.

7-1 Operating & Design Processing Conditions

The Operating & Design Processing conditions of the unit are given as below. According to data table, two series of operating conditions have been presented. Operating1 is for UCO production of 4.72 Vol.% of Fresh Feed, while Operating2 belongs to UCO of 52.8 Vol.% of Fresh Feed. Vendor to consider that their proposed catalyst shall meet both of the operating conditions.

Parameters	Design	Operating1	Operating2
Fresh Feed rate, m ³ /hr	162.3	162	180
Catalyst volume, (3 reactors) m ³	275.1	275.1	275.1
LHSV, hr ⁻¹	0.59	0.60	0.563
Combined Feed Ratio, CFR	1.60	1.61	1.53
Liquid recycle specific gravity	0.8300	0.8480	0.8555
Unconverted Oil, vol% fresh feed basis	3	4.72	52.8
Reactor inlet pressure, barg	193.2	169	169
Recycle gas H2 purity, mol%	93.09 (min. 85)	95.46	91.87
Make-up gas H2 purity, mol%	99.5 (min. 90)	99.33	99.34
Max. Reactor skin temperature, °C	454	431	421
H2/HC Ratio, Nm ³ /m ³	1763	1224	1108
Feed Surge Drum (V-658)			
Pressure, Bar-g.	9.2	9.2	8.9
Temperature, °C	207	192	184
Reactor (V-630, V-631, V-632)			
Reactor Feed Oil, m ³ /hr	81.3	88	87.5
Recycle Gas, Nm ³ /hr	56371	67567	62300
Inlet Pressure, Bar-g	193.2	169	169.0
Inlet Temperature, °C	427	367	362
No. 1 Quench Gas, Nm ³ /hr	15270	1900	900
No. 2 Quench Gas, Nm ³ /hr	13235	450	333
No. 3 Quench Gas Nm ³ /hr	12214	600	400
Max. Catalyst Temperature, °C	454	432	419
Max. Reactor Delta T, °C	55	61	60.3
Outlet Temperature, °C	454	426	416
Water Injection, m ³ /hr	9.7	13.1	13.9
Make-up Gas, Nm ³ /hr	48632	43500	33500

High Pressure Separator (V-633)			
Pressure, Bar-G	182.7	155	155.0
Temperature, °C	54	66	66
HP Purge Gas, Nm ³ /hr	0	0	0
Recycle Gas, Nm ³ /hr	275000	209000	190000
Low Pressure Separator (V-636)			
Pressure, Bar-g	34.5	34.2	34
Temperature, °C	53	69	69
LP Purge Gas, Nm ³ /hr	4502	3420	2680
Turbine Condensate Condenser			
Pressure, mm Hg. abs.	102	243	228
Inlet Temperature, °C	52	67	72
Make-up Gas Compressor (C-601A/B/C)			
1st Stage Suction Pressure, Bar-g.	15.1	15.1	15.2
1st Stage Discharge Pressure, Bar-g.	38.3	36.3	37
2nd Stage Suction Pressure, Bar-g.	37.9	36	36.3
2nd Stage Discharge Pressure, Bar-g.	94.4	79	77.5
3rd Stage Suction Pressure, Bar-g.	93.8	78.5	76
3rd Stage Discharge Pressure, Bar-g.	184.8	160	158.0
Suction Drum (V-660)			
Pressure, Bar-g.	15.1	15.1	15.2
Temperature, °C	35	27	25
Recycle Splitter Feed Flash Drum, (V-637)			
Pressure, Barg	7.3	6.0	5
Temperature, °C	233	173	160
Sponge Absorber (V-638)			
Pressure, Bar-g.	6.1	5.6	5.2
Inlet Temperature	61	65	56
Outlet Temperature	50	49	45
Lean Oil, m ³ /hr	27.8	12	9.0
Recycle Splitter (V-639)			
Inlet Pressure, Bar-g.	1.44	1.42	1.16
Inlet Temperature, °C	380	359	353
Outlet Pressure, Bar-g.	1.1	0.84	0.85
OVHD Temperature, °C	101	92	82
Bottoms Temperature, °C	355	355	354
Stripping Steam, Kg/hr	2860	2600	2010
Expected Max WABT@ EOR, °C	415	398.5	393.8
HCU Feed & Products			
Fresh Feed, m3/hr	162.3	162	180
Make-up H2, Nm ³ /hr	48664	41800	33200
HP Gas, Nm ³ /hr	4502.0	3479.3	2630
LP Gas, Nm ³ /hr	2905.3	4138	2030
LPG, m ³ /hr	5.4	6.4	4.1
Light Naphtha, m ³ /hr	15.8	7.9	6.5

Heavy Naphtha, m ³ /hr	14.7	34	18
Kerosene, m ³ /hr	38.4	34.1	22
Diesel, m ³ /hr	110.9	75.2	50
Unconverted Oil, m ³ /hr	4.9	20.4	95
Recycle Feed, m ³ /hr	97.4	97.2	82.5
Liq. Products Yield, Liq. Vol.%	117.1	109.9	108.6

7-2 Unit operating constraints

The operating constraints in the HCU unit are given as follows in general notes and also in the following Table.

All vendors to note that their Technical Offers should be commensurate with operation of their catalyst system within these operational constraints while meeting the guarantees on product yield, product quality, maximum allowable pressure drop and catalyst guaranteed 1st cycle length at desired throughput and guaranteed conversion. Offers violating these operating constraints will not be considered for further evaluation.

General Notes to be considered in operating constraint category:

- The Unit has a Centrifugal Recycle Gas Compressor (RGC). RGC discharge H₂ purity in case of new catalyst will be maintained typically at the level of 90% and higher.
- The H₂S generated in the reactor section is not removed from the Recycle Gas and no Recycle Gas Amine Scrubber existed in reactors circulation path.
- Make-up Hydrogen gas mixed with recycle gas at the inlet of air cooler before High pressure Separator to the suction of Recycle Gas compressor.
- For all Reactors including R-630, R-631 and R-632, the inlet temperature and WABT for SOR / EOR shall be governed by the maximum allowable Heaters (H630, H631, H632) outlet temperature and maximum allowable reactor outlet temperature respectively.
- The unit does not have any PNA absorption bed facility. Hence, continuous bleeding of small quantity of unconverted oil is done.
- The Unit has provision for liquid phase pre-Sulfiding only.
- Turndown Ratio of HCU is equal to 50% of the design capacity.
- Quench provision is available between the reactors beds (between Bed 1-2, Bed 2-3, Bed 3-4). Therefore the individual bed in the reactor has recycle gas quench facility which is supplied directly from the discharge of the recycle gas compressor at 65°C and 155 barg pressure. Vendor should confirm that the existing quench flow of the reactors be well enough to control the reactors bed temperature at SOR & EOR processing conditions.
- Table below shows the design quench flows of the reactors.

Design Quench Flow, Nm ³ /h	Flow
Bed2 inlet	15270
Bed3 inlet	13235
Bed4 inlet	12214
Note: Quench gas Mol Wt is typically 3.52	

Operating constraints

Sl. no	Constraint	Units	Quantity	Remarks
1	Fresh Feed	m ³ /hr	180 max.	
2	CFR (Combined Feed Ratio)	-	1.4 to 1.6	
3	Maximum Recycle Gas Flow	Nm ³ /h	275000	Limited by compressor capacity
4	Recycle Gas Hydrogen purity before mixing with Make-up Hydrogen gas	Mol %	85% min.	
5	Maximum High and Low Pressure Separator operating Pressure	Barg	182 Barg and 34 Barg	As per design conditions
6	Reactor pressure	Barg	155 min. (183.2 max)	Max value for design case
7	Quench gas Temperature (as measured at Recycle gas compressor discharge)	°C	80 (max), 70 (normal operation)	Recycle gas compressor discharge Temperature as per design case
8	Maximum allowable pressure drop across reactors Beds (R-630, R-631,R-632)	Bar	Bed1: 3.9	As per reactor internal mechanical design. Catalyst also to be designed to sustain the mentioned DP.
			Bed2: 4.7	
			Bed3: 5.3	
			Bed4: 5.8	
9	Maximum temperature to (R-630, R-631,R-632)	°C	413	Limited by Maximum recycle gas outlet temperature

10	Maximum reactor skin temperatures	°C	454	Limited by Metallurgy of Reactor shell
11	Maximum Reactor Delta T	°C	55	Limited by Metallurgy of Reactor's shell and catalyst type. May be revised by vendor
12	Maximum adiabatic Radial ΔT in any Bed	°C	To be minimized	To ensure uniform distribution of feed across reactor cross-section
13	Maximum reactor bed temperature	°C	454	Limited by Metallurgy of Reactor's shell and catalyst type. May be revised by vendor

7-3 Reactors loading diagram

A typical loading diagram for our last catalyst charge is given at the end of this tender. Vendor may consider the limitations and constraints above mentioned for both SOR and EOR conditions and recommend IKORC the preferred loading method & any grading required for each of the beds.

Section 8: Scope of Supply and Services

8-1 Scope of Supply

- Active catalyst (mainly hydro-treating and hydro-cracking) along with inert balls and guards should be supplied in metallic drums with inside Polyethylene lining to avoid any moisture ingress during shipping of the catalyst.
- Vendor shall determine the quantity of various catalysts such as hydrotreating catalyst, hydrocracking catalyst (**only Amorphous catalyst**), De-metallization catalyst etc., along with inert balls to cater to feed mixture.
- Performance guarantee test run (PGTR) shall be conducted within 90 days from the date of introduction of hydrocarbon oil into the new catalyst system. However, in case of refinery / unit constraints, period for conducting performance test run may be further extended for a period of 90 days from the expiry of first 90 days i.e. PGTR may be conducted within a period of 180 days from the date of introduction of hydrocarbon oil into the new catalyst system.
- Catalyst Guaranteed 1st Cycle Length shall be minimum 3 years for entire catalyst from the date of introduction of hydrocarbon oil into the new catalyst system (1st oil-in). Also, vendor

to undertake ultimate **catalyst life guarantee of minimum 6 years** with no more than two regenerations for hydrotreating and hydrocracking catalyst.

- Vendor shall confirm in the technical bid that guaranteed product yields, qualities and specifications for both SOR and EOR are within the limits mentioned in section 6.
- **Vendor to note that catalyst and guards quantity for HCU reactors first bed, shall be considered as Double. Furthermore, Up to 10% contingency/handling loss for active catalyst and guards has been considered for whole catalyst reload, and the vendor shall consider these points in preparing the catalyst.** However if vendor requires to include catalyst or Demetalization catalyst quantity for contingencies/ handling loss, this should be mentioned clearly in the proposal.
- Vendor shall indicate the metal quantity in their offer. Around 20% of the total catalyst loaded can be considered for skimming and dump/screen during catalyst life. Graded materials rate shall be provided and given separately in the current offer with optional price.

3-2 Catalyst Requirement

The catalyst system must also fulfill the following system limits:

1. Using a catalyst system in which the temperature is progressively increased to compensate for activity loss.
2. Catalyst size of minimum 1.6 mm, to minimize high pressure drop at EOR operation
3. Vendor to ensure that the available Emergency depressurizing system and H₂ quenches in HCU unit is capable enough to handle any runaway reaction and Recycle Gas Compressor trip scenarios.
4. The detailed Particle Size Distribution (PDS) for all type of catalysts shall be provided and guaranteed by catalyst manufacturer.
5. Catalyst fine which is catalyst particle with smaller length than 1.6mm should be lower than 0.5wt% and guaranteed by catalyst manufacturer.
6. Catalyst Side Crush Strength should be minimum 12 N/mm and guaranteed by catalyst manufacturer.
7. Proposals shall be based on catalyst(s) commercially proven for similar services. IKORC may demand Vendor to provide actual plant data of the units in which their catalyst (both hydrotreating and hydrocracking catalyst) have been used.

3-3 Scope of Services

Vendor shall provide the following services:

- I. Supply the necessary catalysts & guards as required. Vendor to mention each type of catalysts requirement separately.
- II. IKORC may demand Vendor to provide technical assistance by deputing expert engineers during catalyst loading, start-up condition and Performance Guarantee Test Run activities.
- III. Vendor should provide operating parameters for other modes of operations, like unit operation with the feed stock having Maximum UCO.
- IV. IKORC may demand Vendor to provide periodic evaluation of catalyst performance on quarterly basis for HCU unit and offer technical assistance for troubleshooting arising in the unit till the catalyst is in use even after the guarantee period exceeds. Necessary data enabling the operational problems will be furnished by IKORC.

3-4 Data/Documents to be submitted with the offer

Following information shall be submitted as a part of the technical offer (as per the following table format):

- a.** Vendor to provide Catalyst technical properties such as: Name, Type, Size, Density, Average Bulk Density, Bed Height, wt% of catalyst metal content, (Particle & Side) Crushing Strength, Surface Area, Pore Volume, Catalyst Pore Size Distribution, Catalyst Particle Size Distribution, Attrition Loss, Fine Content, Abrasion. The standard test method for measuring all the properties of each type of catalyst should be provided. Metric system of units shall be used for all information. We insist, the catalyst vendor should avoid giving a range or a limit on all required data and to provide the exact values for each item clearly.
- b.** Catalyst supplier shall provide necessary procedure and loading diagram for the loading of catalyst in IKORC's reactor.
- c.** Catalyst supplier to provide information on the following key operating parameters at SOR/EOR, in the proposal for all cases.
 - Overall mass balance including Hydrogen consumption
 - Temperature/Pressure at the inlet and outlet of HCU Reactors
 - Pressure Drop across each Reactor
 - Weight Average Bed Temperatures (WABT) for each Reactors
 - LHSV
 - H_2/HC ($Nm^3 H_2/m^3 HC$)
 - Recycle Gas & Quench Gases in each Reactor shall be defined. Also vendor to indicate the total H_2 requirement and Chemical Hydrogen consumption for HCU fresh feed.
 - Energy Consumption to achieve highest activity performance of catalyst as Kcal/hr.
- d.** Composition of each proposed catalyst active metals content should be provided.
- e.** Catalyst should be able to handle turndown condition with fresh feed at 50% of design throughput without impact on flow distribution and radial spread temperature.
- f.** Precautions, emergency procedures to be followed during start-up/normal operation/upsets/turnarounds.
- g.** Information regarding catalyst poisons shall be expressed clearly.
- h.** Catalyst packing, handling, storage, loading & unloading, start-up, Pre-wetting etc procedure.
- i.** Reference list of plants where the catalyst has been in operation.
- j.** All necessary technical information or the operating parameters that affect the catalyst performance i.e. SOR & EOR conditions with respect to temperature, pressure, pressure drop, product yield, product quality etc.
- k.** Vendor to consider that catalyst will be loaded into the reactors as determined by IKORC. Guarantees will hold from the time whenever feed is introduced for the first-time.
- l.** Vendor to provide catalyst technical details/Material Safety Data Sheet & manufacturer's specification with the bid documents/Manufacturers certificate of analysis incorporating all properties given in the specifications for each batch supplied.
- m.** Catalyst/Catalyst support material to be packed suitably in air tight polyethylene bags in good condition inside steel drums and placed on heavy-duty pallets.
- n.** Spent catalyst generated after EOR should be safe for disposal as per international Safety standards. Vendor shall specify the standard and provide MSDS for spent catalysts.

- o.** Third party inspection certificate of the catalyst properties and delivery contents. The third-party company must be approved by IKORC and all the expenses of site visit, sampling and catalyst tests, before delivery to be included in the catalyst price.
- p.** Catalyst which consumes lower energy to reach the highest performance over Operating Period will be received higher technical score in this section.
- q.** Vendor shall fill in the tables below for each type of catalyst, exactly as per the following table format. **It should be emphasized that data tables not having this format and arrangement will not be surveyed for further evaluation.**

Table 7: Data Information

MAIN & GUARD CATALYST PHYSICAL PROPERTIES			
CATALYST QUANTITIES	CATALYST HEIGHT IN REACTOR	mm	
	CATALYST VOLUME	m ³	
FORM		-----	
COLOR		-----	
AVE. DIAMETER		mm	
PSD (Particle Size Distribution)		Wt%	
AVE. LENGTH		mm	
SURFACE AREA (UOP 964-11 / ISO9277)		m ² /g	
PORE VOLUME (UOP964-ISO/15901)		cm ³ /g	
FINE CONTENT (UOP 333)		wt%	
BULK DENSITY (UOP 294)		kg/m ³	
RADIAL CRUSH STRENGTH (ASTM D-4179)		N/mm	
BULK CRUSH STRENGTH (ASTM D-7084)		MPa	
LOSS ON ATTRITION (ASTM D-4058)		Wt%	
LOSS ON IGNITION @ 550 °C (UOP 954)		Wt%	
MAIN & GUARD CATALYST CHEMICAL PROPERTIES			
ACTIVE METAL CONTENT	Ni	wt%	
	Mo	wt%	
	Co	wt%	
	...	wt%	
CATALYST POISON RESTRICTIONS		PPBwt	
		PPBwt	
		PPBwt	
		PPBwt	
TYPE OF LOADING (Dense/Sock)			
TOTAL CYCLE LIFE, GUARANTEED		Month	
FIRST CYCLE LIFE, GUARANTEED		Month	
REACTORS INLET TEMP. (SOR/EOR)		°C	
FURNACE ENERGY			

MANUFACTURER		CATALYST NAME			
		FACTORY ADDRESS & E-MAIL			
CATALYST CHARACTERICS **		UNIT	SOR	EOR	
TEMP. Each Reactor	INLET	°C			
	ΔT				
	WABT*				
PRESS. Each Reactor	INLET	bar			
	MAX ALLOWABLE ΔP				
H ₂ /HC VOL. Ratio Total (MIN)		Nm ³ /m ³			
H ₂ /HC CHEMICAL CONSUMPTION Ratio (MIN)		Nm ³ /m ³			
LHSV		1/hr			
Energy Consumption (Fuel gas Consumption in reactor Furnaces)		K cal/hr			
REACTORS INLET TEMP. (SOR/EOR)		°C			

PRODUCTIVITY		UNIT	SOR	EOR
LPG	Total Sulfur			
Light Naphtha	Yield			
	Total Sulfur			
	RON			
	Mercaptan Sulfur			
Heavy Naphtha	Yield			
	Total Sulfur			
	RON			
	Mercaptan Sulfur			
Kerosene	Yield			
	Total Sulfur			
	Aroamatic			
	Freezing point			
Diesel	Yield			
	Total Sulfur			
	Cetane No.			
	Pour Point			
ISO recycle	Yield			
	Total Sulfur			
	Viscosity Index			

3-5 Technical Services:

It is to be emphasized that the selected catalyst vendor shall provide the following technical services at no additional charge to IKORC.

1. Catalyst activity monitoring:
 - i. Vendor's methodology to be provided for IKORC to perform own monitoring.
 - ii. IKORC will send operating data to vendor for detailed analysis of performance and other vital issues. Format and frequency to be mutually agreed on.
 - iii. Vendor to provide relevant technical information, which may include: Best practices, operating guidelines, catalyst monitoring, reactor bed operating temperature profiles, etc.
2. Vendor to provide the following information prior to start-up.
 - i. Temperature program for catalyst conditioning post catalyst loading and start-up, especially for the first few weeks of operation
 - ii. Curves (or similar) which will allow IKORC to adjust reactor operating severity for changes in feed rate, feed properties, conversion, product yields.
 - iii. Quantitative relationship (in the form of correlations, curves, kinetic models) between chemical Hydrogen consumption as a function of: (i) Feed properties (ii) Reactor operating temperature, (iii) Unit operating parameters, or any other factors deemed relevant. This is to enable optimization of operation during Hydrogen supply shortage scenarios.
 - iv. Quantitative relationship (in the form of correlations, curves, kinetic models) between catalyst deactivation vs. parameters such as: Hydrogen composition, feed distillation profile, feed metals content or any other factors deemed relevant.
 - v. Quantitative relationship (in the form of correlations, curves, kinetic models) for conversion and product yield as a function of (i) Feed qualities (for example Sulfur content, Nitrogen content, distillation profile); (ii) Reactor temperature, inlet Hydrogen composition and any other factors deemed relevant, for planning purposes.
3. Vendor to provide start-up procedures specific to the catalyst(s). Also On-site technical assistance should be provided by the vendor to cover the period of time from the start of catalyst activation to the unit being on-line and normal operating conditions as specified in the vendor's proposal.
4. Vendor shall furnish Technical Data Sheet & all physical & chemical properties and Material Safety Data Sheet (MSDS) of each type of catalyst offered. The vendor shall also furnish the list of poisons along with their limits for each catalyst offered.
5. Vendor shall provide sulfiding and regeneration procedures of the supplied catalyst. Also vendor shall provide technical services free of charge for periodic monitoring of the catalyst performance for the entire life cycle of the catalyst.
6. Expeditious trouble shooting advice, emergency procedure.
7. Correlations/graphs to estimate normalized RIT (Reactor Inlet Temperature) and WABT based on the actual feed processed, feed quality and desired product quality. Also Yield Predictions / estimates and products rate on design and existing operating conditions should be presented.
8. Technical Support in safe disposal of spent catalyst in agreement with local & international rules and law. In addition, the vendor will provide detailed technical literature covering all aspects of catalyst operation, safeguarding and special procedures as applicable.
9. Quantity of DMDS required for catalyst sulfiding also to be clarified in bid so that Refinery can initiate DMDS procurement on time.

3-6 Information Required in the Proposal

1. Vendors shall evaluate and advise on the SOR WABT, temperature profile with cycle time to maximum WABT of 415 °C, or reactor bed temperature of 424 °C.
2. In addition to theoretical sulfur required for the active metals and the sulfiding agent requirements, the basis of the calculations is required.
3. Outline procedures for catalyst loading, pre-sulfiding and start-up. Vendor to outline detailed steps for liquid sulfiding, keeping in mind the reactor minimum pressurization temperature of 150 °C.
4. Reactor beds inlet and outlet temperatures curve from SOR to EOR. Reactor WABT from SOR to EOR conditions.
5. Recycle gas flow (and their respective compositions) allocated to reactor inlet and quenches to each bed from SOR to EOR.
6. Yield data (wt% and vol% on fresh feed) from SOR to EOR for liquid products.
7. Calculated Pressure drop for each catalyst bed is required. Catalyst particle dimensions (diameter, length and shape), equivalent particle diameter and voidage should be used (Dense/ Sock loading) in calculating pressure drop.
8. Guarantees offered on catalyst performance.
The catalyst supplier shall provide the following details for all catalyst types including Size & Shape, Bulk density, Surface area, Pore Volume, crushing strength, Loss on Attrition, Loss on Ignition, Pore volume, Deactivation rate, Delta T Max, Number of regenerations, guaranteed life, Total Guaranteed Life Cycle, % fines, Operating Temperature at SOR/EOR, Allowable impurities limits including feed & products Sulfur, Nitrogen, CCR, Ni, Va, C7 Insoluble. Also the analysis details for all catalyst types including Active Metals (Ni, Mo, SiO₂, Al₂O₃, and etc. to be provided.
9. Life of the catalyst (guarantee)
10. Maximum sulfur content of products (guarantee)
11. Maximum Nitrogen content of products (guarantee)
12. Bulk & Side Crush strength of catalyst
13. Catalyst length size distribution & Average length of the catalyst
14. Catalyst fine content
15. Cumulative metal poison limit of catalyst (metal trap capacity)
16. Active metals content of each catalyst type
17. Performance and cycle length guarantee
18. User reference list; reference units must have these criteria with nearly same feed specification.
19. Catalyst supplier shall provide guarantee for yield, product specification, reactor pressure drops and catalyst life
20. Certificate of analysis
21. Third party inspection certificate of the catalyst properties and delivery contents. The third-party company to be approved by the refinery (IKORC) and all the expenses of site visit, sampling and catalyst tests, before delivery to be included in the catalyst price.

Section 9: Evaluation Criteria

The commercially offer must be equal with the following formula:

$$L = \frac{100 \times C}{100 - i \times (100 - t)}$$

L = Equal Price

C = Offer Price

t = Technical Privilege Based on Table 7 (for accepted must be $t \geq 60$)

i = Coefficient Effect (for catalyst $i = 0.4$)

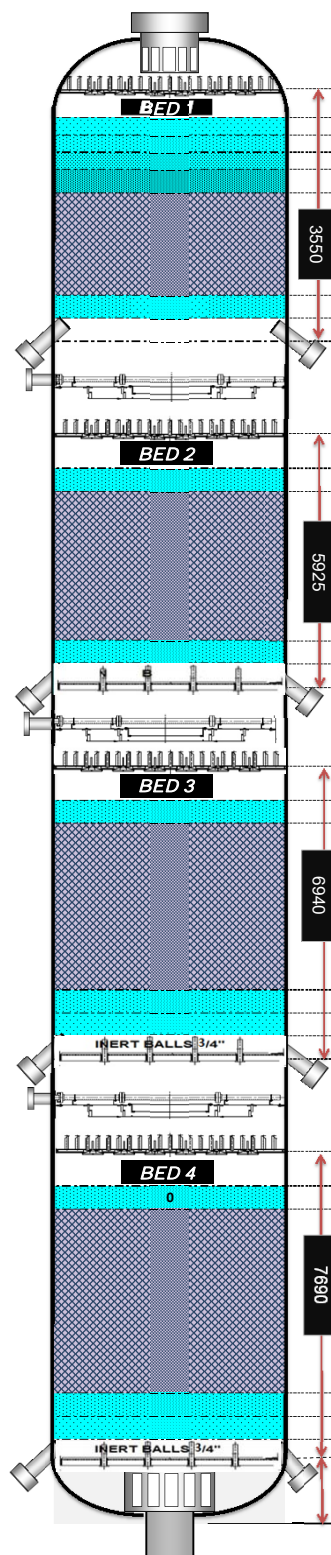
Offers not meeting guarantees above mentioned is liable to be rejected.

Table 8: Technical Privilege Form

Attached form: Technical Privilege			
Objective	Effectiveness (%) on Objective	Sub. Objective	Effectiveness (%) on SUB.Objective
Operating Cost	20	SOR/EOR	25
		H ₂ Consumption	65
		Energy Consumption	10
Catalyst Life	30	Guaranteed Cycle Length	50
		Guaranteed Total Life	50
Products	40	C3+ Yield	20
		UCO Yield (Case1)*	25
		Naphtha Yield	15
		Products Specifications	40
Technical Support	5	Performance Guarantee	50
		Technical Services	30
		User Reference List	20
Catalyst Property	5	Physical Property	50
		Chemical Properties	20
		Loading Arrangement	30

* Middle Distillate Yield (Case2)

R-630

[illegible]